

Yachaykusun

Lessons on climate change from the Andes



Schweizerische Eidgenossenschaft
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Swiss Agency for Development
and Cooperation SDC



PERÚ

Ministerio
del Ambiente



PACCPERÚ
Programa de Adaptación al Cambio Climático

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Facilitator consortium PACCPeru:





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PRELIMINARY WORDS

MINISTRY OF THE ENVIRONMENT

THE MINISTRY OF THE ENVIRONMENT considers it an immense privilege to present the book “*Yachaykusun: Lessons on climate change from the Andes*”, which shares the experiences generated through the implementation of practices that strengthen resilience under conditions of a changing climate. The main players in this story are rural peasant families and communities that live in poverty in the highland watersheds of Huacrahuacho (Cusco region) and Mollebamba (Aurimac region).

The Climate Change Adaptation Program - PACCPeru supported these actions in its first phase (2009-2013), which was based on two thematic axes. The first axis corresponds to practices to manage the ecosystem and natural resources to improve water yields and maintain livelihoods. The second axis corresponds to practices that focus on the families’ well being and on protecting the most vulnerable population and children in particular.

One of the main challenges of climate change entails mobilizing and sharing experiences and knowledge. Along these lines, the stories, photographs and technical files that are presented in the publication, are a source of specific information about concrete actions that should be fostered to strengthen the resilience and adaptive capacity of rural families and communities that live in the ecosystems of the Andean highlands.

We hope that this publication motivates and inspires others to replicate these practices, beginning with actions to promote initiatives at the public entity, private and civil society levels so that rural highland communities that live in poverty can improve their quality of life and are better prepared to face the challenges that climate change adds to an already difficult daily existence.

Manuel Pulgar Vidal
Ministry of the Environment

SWISS AGENCY FOR DEVELOPMENT AND COOPERATION (SDC)

INCREASINGLY, CLIMATE CHANGE IS ONE OF THE MAIN problems hampering the progress of developing countries. It constitutes a major challenge for Andean countries like Peru, which is highly vulnerable. In Peru’s interior, rural populations in the Andean highlands are more vulnerable social groups given that their livelihoods are closely tied to natural resources, which are subject to a series of pressures stemming from climate change.

To contribute a solution to this challenge, the Swiss Agency for Development and Cooperation (SDC) intervened through its Global Program for Climate Change. The Climate Change Adaptation Program – PACCPeru is inserted in this framework. It is a bilateral cooperation program that is managed by the Ministry of the Environment (MINAM) and facilitated by the consortium Helvetas Swiss Intercooperation, Libélula and Predes, which, together with other initiatives in the Andes, contribute to supporting rural adaptive practices by generating incidence and developing the capacities of the main actors in climate change adaptation.

The adaptive practices and life stories presented in this publication –which were promoted by PACC in its first phase (2009-2013) in alliance with MINAM and its partners– bring to the fore the successful and innovative responses of rural populations in the Andean highlands in a scenario of climate change. These stories provide evidence that can strengthen public policy and contribute to global knowledge about social experiences that address the challenges posed by climate change and reaffirm Switzerland’s commitment to cooperate in efforts to face global challenges.

Yuka N. Greiler
Head of Global Program Climate Change
Swiss Agency for Development and
Cooperation SDC

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Ambassador
Embassy of Switzerland in Peru



PROLOGUE

WE HUMANS ADAPT WHEN WE ADJUST TO CONDITIONS IN OUR ENVIRONMENT. If climate changes and its effects are here to stay, there is no other choice: to adapt and live better. For this reason, in 2009 the Climate Change Adaptation Program – PACCP Peru was born, in the watersheds of Huacrahuacho, Cusco and Mollebamba, Apurímac.

The stories that make up this book come from experiences generated during the program's first phase—which ended in April 2013—which was implemented jointly with regional and local institutions, organizations, and community members from both watersheds. These men and women are the main players. During the first days of September 2014, we visited them to hear their voices.

On the pages that follow, we discover how much the life of Silverio, a peasant farmer, has changed since he began to manage a meteorological station.

Bernabé and Marcelina, and also Américo, will show us what sowing and harvesting water in their family *qochas* entails. We will also learn about this when looking at other lakes, such as the ones built by the community of Samuel and Guillermo on a pampa where residents used to play football, and the one by the community of Eleuterio, in a highly eroded area.

We will accompany community leaders Wilfredo and Renzo, and Pio, Demetrio, Sózimo and Nemesio on their visit to two large natural pastures, which have been temporarily enclosed to ensure their recovery.

We will see how cultivating grass such as alfalfa and practicing agroforestry has changed the lives of Belinda and Rufo. Or how Tula and Cayetano raise guinea pigs, next to their vegetable garden under sprinkler irrigation. Or the virtues of Antonio and Efrosina's plot, which is nurtured with organic fertilizer.

We will climb to the high lands of the alpaca farmers to see how Agustin and Magdalena plant lettuce in their vegetable garden with a greenhouse. And we will see how their daughters Kelly and Mery learn about the benefits of vegetables in a garden at their school, which is just like the one they have at home, and how the classroom is heated in the middle of the puna.

Victoria and Yolanda, two community leaders, accompany us on our visit to an early stimulation center where the children learn through play and specialists monitor their diet and growth. Not far from there, Jenifer and Elio (another community leader) will introduce us to their young children, Esmith and Edu, who love poetry, and we will see that childhood stimulation is not just a theory.

We will visit the healthy home of Ricardina, which is an excellent example of adaptation to climate change. And we will also see Deisy, a brilliant fourteen year old girl who is a member of her school's club for ecologists.

And we will travel to the school that Carlos directs, where the children Cliberht and Julio are environmental brigadiers and lead actions, along with forty-six other students, to reduce-reuse-recycle waste.

With all these people, the future of adaptation looks promising. ■



*If the climate
goes crazy,
can we adapt
ourselves?*

More heat. More rain. Less rain. More glacier melt. More water scarcity. The effects of climate change are here to stay. The experts have no doubt that human beings have altered the composition of the atmosphere through greenhouse gas emissions. This has led to changes in climate over a prolonged period and all this adds to the natural variability. The scenarios for this century are pessimistic.

P

ERÚ, A MEGA DIVERSE COUNTRY IN TERMS OF CLIMATE —WITH 27 OF THE WORLD’S 32 CLIMATES— IS ONE OF THE COUNTRIES THAT IS MOST VULNERABLE TO THE EFFECTS OF CLIMATE CHANGE. THE TEMPERATURE IS EXPECTED TO RISE 1,6 °C DEGREES IN THE ANDEAN HIGHLANDS BY 2030. RAINS WILL OCCUR OUT OF SEASON AND WILL BE HEAVIER AND MORE CONCENTRATED. WITHIN ELEVEN YEARS, GLACIERS BELOW 5.000 METERS MIGHT HAVE COMPLETELY DISAPPEARED. AND IN ANOTHER 40 YEARS, IT IS ESTIMATED THAT WE WILL HAVE ONLY 60% OF THE WATER THAT WE HAVE TODAY.

To address future scenarios, the Climate Change Adaptation Program-PACCPERÚ, was established in 2009. This is a bilateral cooperation initiative between the Ministry of the Environment (MINAM) and the Swiss Agency for Development and Cooperation (SDC), given life jointly with numerous organizations and institutions. “We began our work with trying to answer some basic questions,” explains Lenkiza Angulo, the program’s national coordinator. One: “Which conditions will the inhabitants need to adapt to and what needs



»» The most vulnerable population. They are peasant farm families that engage in subsistence agriculture and livestock raising for local markets.

PACC's Agreement

The Climate Change Adaptation Program-PACC Peru, in its first phase, has operated in conjunction with the regional governments in Apurímac and Cusco, and the local governments of Checca and Kunturkanki, in Cusco, and Juan Espinoza Medrano, in Apurímac. Currently, in its second phase, it will continue to work with these regional governments and has begun to collaborate with the Cooperation for Social Development Fund (FONCODES) through the Haku Wiñay Project (Mi Chacra Emprendedora) and with the public universities of San Antonio Abad, in Cusco, and

Micaela Bastidas, in Abancay. The program is facilitated technically and administratively by a consortium led by HELVETAS Swiss Intercooperation, which includes the consultancy company Libélula and the Center for Disaster Studies and Prevention (PREDES). Similarly, the program receives assistance from a consortium of Swiss scientific entities, which is led by the University of Zurich. The measures promoted in the first phase of the program were implemented through peasant farmer competitions organized jointly with the civil association Pachamama Raymi.

to be adjusted?” Two: “Which vulnerabilities do they have given these changes and how can they be reduced?” Three: “Which actions can help rural populations adapt?” And four: “Which initiatives, which are already underway, can serve as a solid base for adaptation to climate change?”

Two zones of the southern Andes of Peru were chosen to participate in this program: the watersheds of the Mollebamba river, in Apurímac, and of the Huacrahuacho river, in Cusco.

The selection —which was made with regional authorities—was neither quick nor simple. First, fifteen potential watersheds in Cusco and another six in Apurímac were identified. The areas that were the most vulnerable and threatened due to climate change were sought.

PACC operates in the rural Andes, where the most vulnerable populations live: peasant farmers that engage in subsistence agriculture and livestock raising for local commerce.

Of the initial number, six finalists were chosen (three per department). After the last selection process, two remained.

The Mollebamba watershed is home to five peasant communities of the district of Juan Espinoza Medrano. The larger part of its territory is in the high zone, above 4,000 meters. The low area, which is between 2,950 and 3,500 meters, covers barely 3.6% of the territory but is home to the majority of the population, which is dispersed across four of the five communities.

The Huacrahuacho watershed covers a territory that is half the size of Mollebamba but nonetheless has more communities: five correspond to the district of Checca and eleven to Kunturkanki. Its

territory is at a higher altitude: between 3,750 and 4,700 meters.

*

PACC operates in the rural Andes, whose residents constitute our most vulnerable population: people who live in conditions of poverty and whose livelihoods are based on primary activities that depend on natural resources, which have been compromised by the effects of climate change. These are peasant families that live off subsistence farming and livestock, which they sell in local markets.

The main players in this program are the eight thousand residents of the watersheds. They have

1.758 beneficiary families.

194 qochas to sow and harvest water.

118 hectares of communal natural pastures protected.

125.000 seedlings planted in 19 communities.

inherited a system of ancestral knowledge and traditions that include observing the constellation *Suchu* to predict the onset of the rainy season to organize their agricultural calendar, as well as cultivating plants that “call” the water. Although the concept of climate change does not exist in their language—in Quechua there is no term to define it— “they are familiar with the issue,” emphasizes Lenkiza Angulo. “This belongs to their day to day life, and is part of the observations that the peasant farmers use to act on their environment.”

Marcelina Huilca, who is from the Hanansaya Ccollana community, says: “It isn’t like it was before. It rains at anytime and frosts at anytime.” Wilfredo Mancilla, from Mollebamba, says: “There is drought and some springs are

disappearing.” Samuel Huarca, from Pucacancha, says: “There has been a torrential rain, afterwards a *veranillo*, followed by a drought, a frost, and everything has wilted.” Guillermo Taparaco, who is also from Pucacancha: “We have never seen hail in August. This is climate change.”

Studies confirm the perceptions of the community members. In both watersheds, a change was detected in the rainfall regime and precipitation has dropped; minimum temperatures have descended while maximum temperatures have risen; frost and hail have become more frequent; and the water flow of springs and rivers has fallen. The consequences have been significant: for example, less agricultural production due to drought conditions; delay in sowing and harvesting periods; native plant

» Vulnerable populations. The extreme events produced by the effects of climate change require strengthening the capacities to care for and protect children under the age of five.



Huacrahuacho's watershed



16
communities

Community members, organizations and institutions pool their knowledge to respond to climate change.

varieties and seeds that have been lost; natural grass that has frozen over or wilted due to a lack of water; cattle that have grown weak and died; and a decline in milk, meat and fiber production.

*

To improve adaptation, this program has implemented two blocks of measures in

collaboration with the community members. The first, the “green axis,” has to do with improving natural resources. Here, water is essential. “How can we improve water availability during periods when it is most needed?” asks Victor Bustinza, deputy coordinator of PACC. The answer lies in building simple *qochas* or lakes to recharge the aquifers (sowing) and store the water (harvesting).

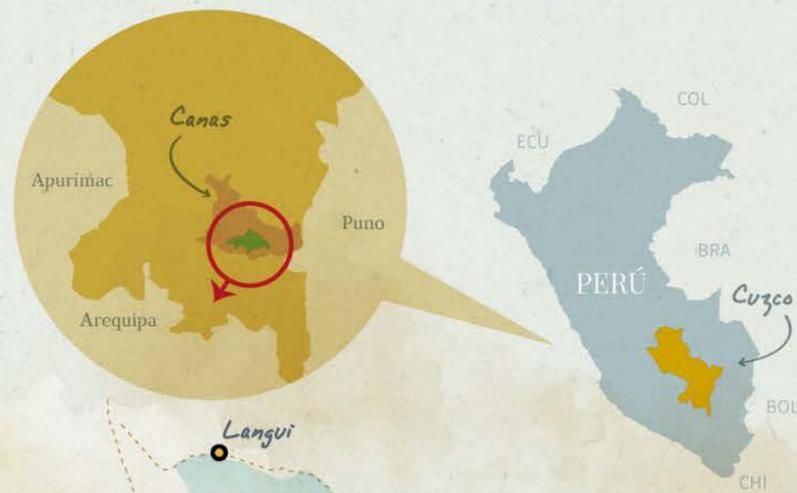
The other major initiative to recover water-related capacities has entailed managing natural pastures with enclosures. “The pasture acts like a sponge and as long as it is green, it will have the capacity to absorb, infiltrate and recharge water,” says Lenkiza Angulo. To strengthen this function, degraded areas have been afforested with native trees such as qolle, qishuar, queñua and chachacoma, and pine.

80% of the families participated in the peasant farmer competitions.

276 family vegetable gardens in Kunturkanki.

14 early stimulation centers in Huacrahuacho.

6,4% decrease in chronic childhood malnutrition in Kunturkanki.



Mollebamba's watershed

5
communities

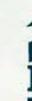
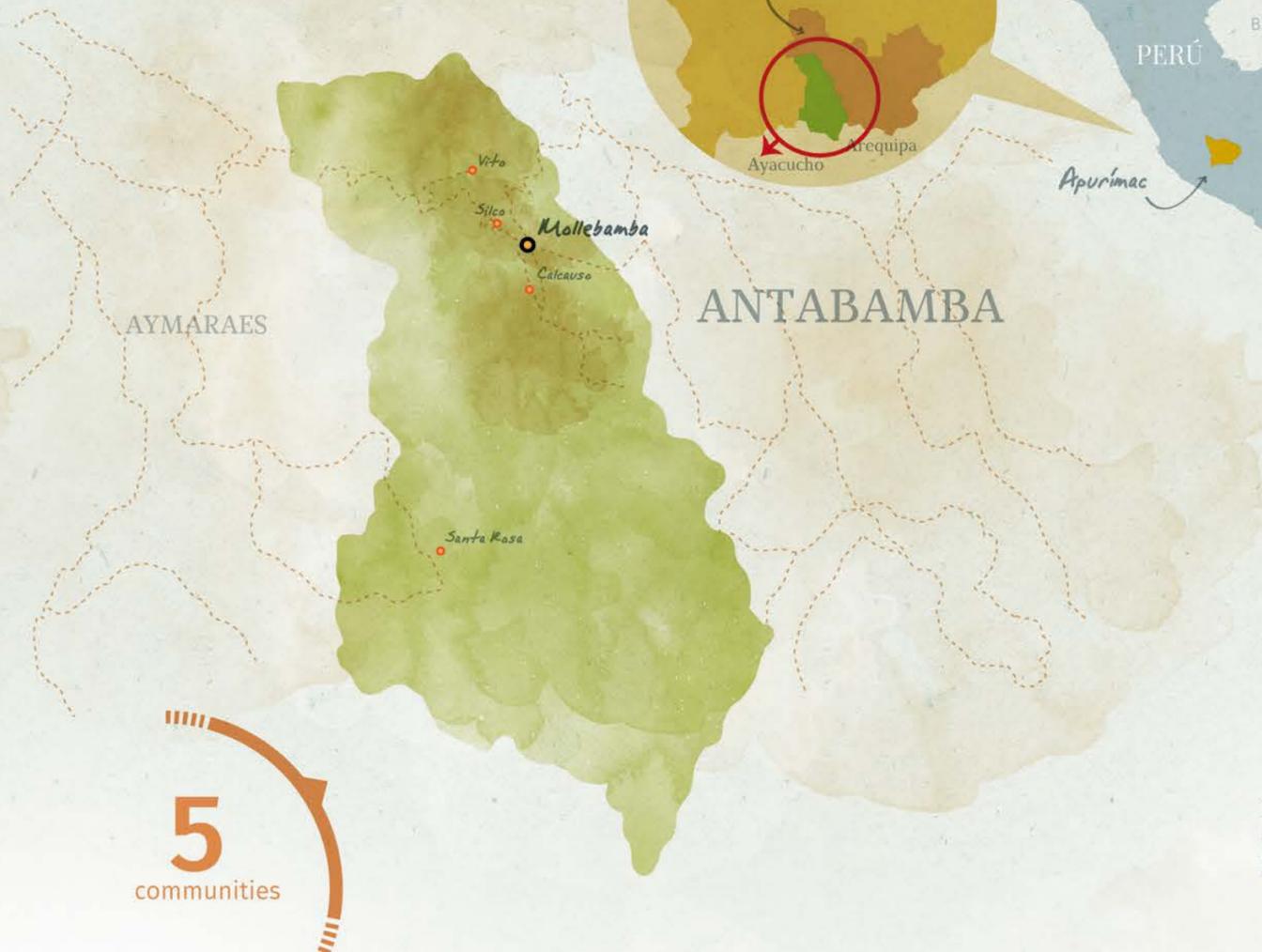
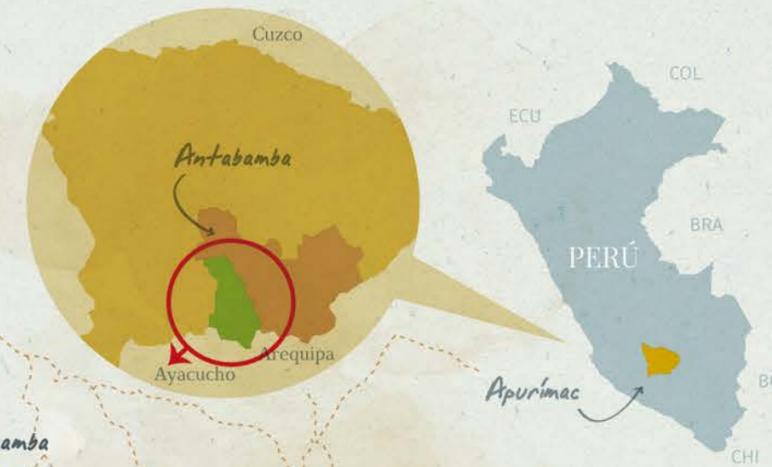
The program also encouraged the use of sprinkler irrigation, the improvement of agricultural production on family lots with agroforestry practices—the combination of trees and crops—; the production of organic fertilizer; and the cultivation of fodder grasses, to improve cattle production and compensate for a lack of fodder during the dry season.

The second group of measures, related to “family well being,” are directed, for example, at young children, who are the most vulnerable to climate change. In this context, the program has promoted early stimulation of children who are between zero and five years of age; encouraged breast feeding; and the monitoring of the growth and development of the youngest members of the community.

This program has also sought to strengthen family health through nutritious diets, and has promoted food security by installing homestead gardens to grow vegetables and by encouraging families to raise small animals, such as guinea pigs. Efforts have also been made to convert old, one-room dwellings into larger, more organized and healthy homes. “Housing is a good starting point from which people can adapt to climate change,” explains Victor Bustinza. “They often say: ‘If I changed this, I can change other things.’ “When we started, there was no recipe for ‘this is how we are going to adapt to climate change’. We have learned to do it with the support of many actors. It is a social construct.”

425 families improved their homes in Huacrahuacho.

102 participants in the Program for Leaders in Climate Change.

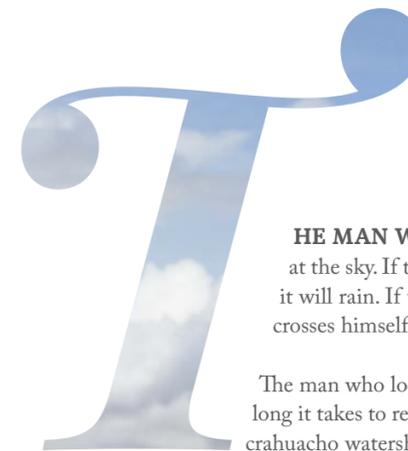


— THE MAN WHO LOOKS AT THE SKY



*"Apu Laramani,
oqqe punchuyuq tiyasian,
wawankunataqmi,
oqqe punchunta khawarispa,
sonqon llanllarishian.
Apu Laramani,
hisp'ayta kallirimushianña,
pachamamanchis ph'uturinanpaq,
chaywantaqmi wawankuna
kausananpaq.
Parañawiyuqmi, phuyukuna
lloqsirimushian mama
lamarqochamanta, llactanchiscuna
qomeryananpaq".*

(pag. 21)



THE MAN WHO LOOKS AT THE SKY leaves his home and looks at the sky. If the wind is coming from the west and the clouds are black, it will rain. If the wind is coming from the south, a frost may occur. He crosses himself and says goodbye to his wife and two small children.

The man who looks at the sky walks briskly for a half an hour. This is how long it takes to reach the center of his community, Pumathalla, in the Huacrahuacho watershed in Cusco, at 3.900 meters above sea level. In this area there is a community meeting place; a veterinary care center for artificial insemination; Primary Education Institution 56163; an early-years school; a small church that has been painted maroon; a sign that says: "Christian Community" and a miniscule white steeple that is separated from the nave; and a Support Services Center for Rural Habitats, or a community Tambo. And there is a meteorological station. This is the destination of the man who looks at the sky.

The Climate Change Adaptation Program (PACCP Peru) set up shop in this small community of 260 families, whose homes are scattered among different land parcels, in April 2011. PACC also set up a station in the Mollebamba watershed in Apurimac. This station is automatic, whereas the station in Huacrahuacho must be read manually. The man who looks at the sky is in charge of writing down data for each day. His name is Silverio Choquenaira and he is 50 years old.

Before this program began, Silverio's life was like this: he lived in an adobe house with a straw





*Apu Laramani, you are sitting on your
gray poncho (fog). We, your children,
feel happiness in our hearts when we
see you this way!*

*Apu Laramani has begun to relieve
itself (rain) so that our mother earth
can bring forth fruit so that we, her
children, can feed ourselves.*

*The clouds, with tears in their eyes
(rain), come from the sea and the
lakes so that our towns can be green.*

The meteorological station is simple. It contains four thermometers that are placed in a box that is far off the ground. Residents must stand on a rock to take readings. The station includes a rain gauge, an anemometer, and an evaporation tank.

roof and three rooms, alongside his wife, Rene Pontecil, and his four children. He planted potatoes, barley and quinoa, did odd jobs in construction and took care of the family's five cows, whose milk was used to make cheese for sale.

He had never heard of the concept of climate change. Of course he had already noticed that things had changed: "Right in the middle of a rainy month, a frost occurs. Or during the dry months, it starts to rain. It isn't how it used to be when I was young: if it was to be dry, it was dry; if it was to rain, it rained. Now it's different". The winds blow stronger as well, he complains. At mid-day, he can no longer walk *qalapata*, or barefoot: "The sun is very strong." This isn't purely theory: this year the harvest was lost after an unusual frost in March, just when the crops were flowering.

Silverio had no idea what a wet temperature was and had never worked a rain gauge. Through an agreement with the National Meteorology and Hydrology Service (Senamhi), the families of four community leaders were trained to monitor the meteorological station. The family of Silverio and Rene was one of those chosen to perform this task. The second family was Silverio's neighbor, Julian Mamani, and his wife, Elsa Chino. The other two families eventually jumped ship. "And my neighbor Julian and I assumed the responsibility of reading the weather" for four months a piece.

*

Silverio —or Julian, when it's his turn— takes data three times a day: at seven in the morning, one in the afternoon, at a seven at night. If they

were to calculate, they would find that it takes a total of four hours to go to the station, gather information, and return to their homes. If Silverio is busy, his wife goes. And if both are busy, one of their children Santos (15 years old) or Uber (12 years old) is in charge. The other two children, Hilda (20) and Fredy (18) can't help because they are studying in Sicuani, which is one hour and a quarter by car. Regardless of who ends up going —"I usually overlook everything because I have more responsibility," says Silverio— that person takes down the temperature, wind direction and speed as well as data on precipitation and evapotranspiration, which is necessary to determine water loss from the soil and vegetation cover.

—It is interesting how, through this effort, a process of empowerment is underway —says Lenkiza Angulo, national coordinator of PACC—. These actions of measuring, observing, and registering are not mechanical. Silverio interprets what he sees according to his knowledge, in an autonomous and spontaneous manner.

Every morning, after filling out a sheet and writing the data in a notebook, Silverio disseminates his findings —in addition to the data flow to Senamhi—through the two radio stations in El Descanso, the capital of the district of Kunturkanki. Generally, the stations Radio Santa Cruz or Radio Enlace call him on his cell phone. Sometimes, Silverio leaves the information with Miss Carmen or Mr. Cuéllar, at Education Institution 56163, so that they can speak with the radio stations. But he likes to do it in person.

Sometimes, if extreme values are registered, he walks to Radio Santa Cruz to offer advice to listeners. "When there is a strong dip in the temperature, I will warn them, because this is when children and old people get sick. One needs to bundle them up with our sheep wool clothing." Or when the pluviometer indicates that it has rained heavily, "we need to be careful around streams and with the river flow so that children and animals don't fall in. This is how we prevent accidents. I come to my own conclusions. Nobody tells us these things during training".

And can you know when it will rain or frost? "I can make an educated guess. But I don't know the future." When they ask him to make predictions, Silverio turns to the ancestral knowledge he learned from his grandparents: "*Wichay lado kutiyuqtam wasitaqa ruwakuna siempre*. When the wind comes from the south, there will be a frost. *Qasan qasanga*. It



➔ Measuring instruments. Local residents use weather stations to access valuable information to make decisions on day-to-day basis in the field.

is going to frost, going to frost. *Uraymanta wayra qamun chayqa paran chayanqa*. And when the wind comes from below, it will rain. *Parawayra qamusbkan*. Rain winds are coming."

With this knowledge and his recent experience in tow, Silverio Choquenaira attended InterCLIMA, a climate change meeting, in Cusco and Lima. And he was proud to attend, dressed in traditional garb from Canas. You could just imagine him climbing Oqquesopa, the small hill that reigns over Pumathalla, to be closer to the constellations to predict the weather.

With his embroidered orange jacket, cap with silver tassels, white handkerchief on his shoulders, a poncho tied at the waist, black cloth pants with white booties and his yankees, he told politicians and experts: "Don't forget about the peasant farmers. People may have a lot of mo-

ney, but can they eat money? No! The peasant farmers provide them food. Food is necessary for people's progress." And this man, the peasant farmer Silverio, husband to Rene and father to Hilda, Fredy, Santos and Uber, spoke to them about the need to protect their traditions. For example, paying the *apus* like the Laramani, where—he said—the water of Kunturkanki comes from. And he explained to them that, when he was young, that powerful hill was covered by "a white poncho" of snow. But not anymore. And he warned them: "Without water there is no life." Silverio has spoken. ■



Qochas

Water is and will be a key factor in adaptation to climate change. This is even more so in regions such as Apurimac and Cusco, which will suffer from water shortages in the near future. The creation of simple reservoirs, which requires little investment in material and manual labor, allows families and communities to store water and recharge the aquifers.

—
"¡UNUNCHISTA
UYWASUN!
¡WE RAISE
WATER!"



*By building qochas for sowing and harvesting water,
we can attenuate the effects of future droughts*



W

HEN ROLANDO HUACARPUMA, a member of the village community, heard about sowing water for the first time, he said: "How are we going to sow water!" And when they told him that water could also be harvested, he responded: "Harvest, we harvest potatoes." Eleuterio Huaycho had also never heard anything about this. His wife, Brigida Consone, and the son of his cousin, Roger Huaycho, had never heard about this either. In fact, none of the four members of the Quillihuara community had ever heard such a thing. It was the same story for Americo Taparaco, from Oquebamba, and Bernabe Huarca, from Hanansaya Ccollana, all inhabitants of the Huacrahuacho watershed in Cusco. Agustin Lupa and his cousin Amilcar Aroni, from the community of Santa Rosa in the Mollebamba watershed in Apurimac, were new to this concept as well.

They all knew about *qochas* or lakes, which have been part of the traditional knowledge of peasant farmers in the highlands for centuries. When the Climate Change Adaptation Program – PACCPPeru arrived, it offered the farmers a special way of understanding their use. In this case, *qochas* are water reservoirs—the experts call them "small rustic reservoirs"—that were built on natural depressions in the landscape. These structures are simple: you only need a dam made of compacted soil and rocks and the structure doesn't have to be too high—between eighty centimeters and a meter—and with this, it is possible to gather and store rain water or water that comes from a spring. These reservoirs are effective: they don't just gather water; they also facilitate infiltration and recharge the aquifers. And they are cheap: the budget required is up to one thousand times less than that needed to build other artificial *qochas*.

Eighteen communities made agreements and collectively construct infiltration ditches and ditches for recharging; improve the natural qochas, afforest the head of the watershed; and protect springs and bogs.

"The scenarios that we will see in the region will be very critical in coming years," warns Victor Bustinza, assistant coordinator of PACC. "The temperature is going to rise and the rains will diminish in the months that we need water the most." Things are already complicated: the onset of the rainy season is delayed from September to November or even December. And if it does not rain during sowing, how will rain-fed agriculture, which accounts for 80% of all farming, survive?

The first *qocha* that this program supported was in Quillihuara, in the district of Checca, Cusco, in early 2011. At the beginning, it was not easy. At the communal assembly held on the 10th day of every third month, the idea was not well received.

—How is the situation going to change? How is there going to be water if this land has always been dry? The older members of the group said this —remembers Eleuterio Huaycho, who is now 40. At that time he was just another member of the village community. Today, he is the community's president.

No one wanted to offer their land to build a lake. Eleuterio offered his plot in the Janccoaque sector, although the *qocha* would benefit the community. Seven hectares were cordoned off to protect eroded land that had little grass. This area was afforested with more than three thousand seedlings of qolle, chachacoma, ceticio, and pine. And a 1.20-meter dam was built in a natural hollow. The only thing left to do was wait for rain.

The majority of the villagers worked on this effort. Eleuterio, and his wife Brigida, who is 38 years old and mother to seven children, joined the effort; along with Roger, who is 23 and the son of Eleuterio's cousin, who lives on a plot a few hundred meters below with his young son Guido since he widowed three and a half years earlier; and Rolando, 40 years old, a villager who received training and directed construction, fencing and forestation work.

This was how *qocha* Quellopampa was born, one of four that were built in the area. And in only two years, the effects were evident:

—We have noticed that those springs —Eleuterio points at a spot below the fenced land, in the direction of a wetland next to which his two horses graze— are kept wet by the *qocha*. We think that the moisture filters underneath. That's the truth!

The experience in Quillihuara was a success and defined the strategy: it was necessary to build more of these lakes. To do this, PACC organized *qocha* competitions with a motto that was as pictorial as it was poetic: "*Ununchista uywasun, we raise water!*". The result was surprising: in two years 146 reservoirs were built in the Huacrahuacho watershed —135 for families and 11 for communal use, all of different sizes and volumes; some of temporary use and others permanent— and 48 more in the Mollebamba watershed, all of which were for family use.



➔ Team work. Every year, the peasant farmers clear their small springs of weeds so that the water can flow easily to their parcels. While they clean up, they perform rituals to show gratitude to the water.

Americo Taparaco, 33 years old, was not aware of the importance of *qochas* in reducing the impact of climate change. He heard about it on the radio, one day at breakfast or over dinner, he is not really sure. His wife Leoncia Taparaco, 28 years old, his son Jesus Manuel, 8 years old, and his little sister Belen, 12, were with him. "During that program they talked about sowing water. And I said to myself: Why don't they come here?" Later, courses were given and experts provided on-site orientation and Americo eventually decided to expand and strengthen the dam of a small lake that he had created when he was just a teenager. It took eight hours over a twenty-day period to improve it.

Life in Sik'anka, the sector of Oquebamba where Americo was born and raised along with his thirteen brothers, is not easy. The life of Americo and his family is also not easy. He has three cows, six llamas, and five sheep that are watched over by a dog that he named Tarzan because his father had spoken to him about the "brave man" of the jungle when he was a boy. He harvests barely enough bitter potato to make chuño. At 4.200 meters above sea level, the frost and the hail destroy almost all of the crops.

"We are seeing that climate change is drying everything up here, or on the coast, in most of the world. This is why I need to make more *qochas*", he says. Now, thanks to the liquid that is stored from December to July, his livestock can graze closer to his plot because grass has grown again; the springs that are down the slope have more water. It was even possible to take water to a water tap he installed next to his adobe and ichu house. Americo Taparaco imagines the future where his *qocha* is protected by native trees. He will plant them soon. "What is the future going to be like?", Eleuterio Huaycho asks himself from Quillihuara, a few kilometers away. "Water. Where there is water, we can maintain our animals and make some grasses grow. Water is important. There is nothing else." ■



➔ **Necessary maintenance.** Community members Brigida Consonne and Clemente Choquipuma work on the reinforcement of the dam of a qocha in Quilinuara. The positive effects of this lake are evident in land below, where small springs have been recovered.



» **A bird's eye view.** To improve water regulation services throughout the territory, it is necessary to ensure that water resources at the head of watersheds are protected, and facilitate infiltration and aquifer recharge.

➡➡ **Under the Laramani.** Community member Américo Taparaco has built a qocha at the foot of an apu that protects Oquebamba. Moisture has helped recover natural grazing land and his cattle can now graze closer to his home.



➡➡ **The strength of leaders.** Eleuterio Huaycho (left), president of the community of Quillihuara, convinced the rest of the community that it was necessary to build a collective qocha. Rolando Huacarpuma (right) supervised its construction.

• QOCHAS •

A family experience

A qocha as a prize

Bernabe and Marcelina had a small lake on their plot. In 2011, they decided to take a chance on improving it, like others, and increased its capacity. Their effort is an example of success.



➔ To be the best. Bernabé, Marcelina and their grandson, Brian, stand happily next to their prize-winning qocha.

Bernabe Huarca is a quiet man who smiles from time to time by pursing together his lips and slanting his eyes below his grey hat. To reach his *qocha* from his house, he has to walk about ten minutes—five at a quick pace—climbing and going down a couple of hills. Bernabe is 69 years old. His wife, Marcelina Huilca, is 62. They live in the community of Hanan-saya Ccollana, Cusco, at 4,630 meters above sea level where the only thing that grows is natural grass.

Marcelina arrives at the edge of the lake wearing a maroon hat and a polar jacket.

—We can't grow anything here. This is why my children left — she laments.

She is carrying two small buckets. She is going to

milk her cows. They have eight. And twenty-nine alpacas. And thirty-three sheep. She is accompanied by her grandson, Brian, who is 11 and has come to visit them from Langui and help them with their chores. They are followed by two dogs: one black, Renon, and the other brown, named Rocky.

The *qocha* is large but is only for the family's use. It is dark in color, perhaps due to abundant aquatic vegetation. Its name in Quechua, Yanaqocha, means "black lake." It is a micro-reservoir for mixed use, for sowing and harvesting; this means that it allows the water both to infiltrate and to be stored superficially.

One day in 2011, on Radio Tawantinsuyo, Marcelina heard: "Take care of the water, it is going

to dry up. Make rustic reservoirs." Where her *qocha* is today, there used to be a smaller one "only during rainy season." They received a visit from an expert from the Program for Adaptation to Climate Change, who inspected it. He told them that they could expand the dam and in this way, boost storage capacity. And he encouraged them to enter the first competition that they were going to organize in the districts of Kunturkanki and Checca. He also explained that they should dig infiltration ditches in the upper part to improve rain collection and plant native trees in the area. In this way, when the trees grew, they would maintain moisture, control erosion and help infiltrate water through their roots.

—As I am old — Bernabe reminds us—, I didn't know how to do it.

His grandson Roger, Brian's teenage brother, who also brought trout spawn to raise, lent a hand. "He is strong, and works hard." Together, they cut dozens of *champas* —chunks of soil compacted with roots— with the *chaquitaqlla*, an agricultural implement from pre-Incan times, and piled them up to create a two and half meter wide dam that is various meters long.

The *qocha* of Bernabe and Marcelina competed against reservoirs from seventeen other commu-

nities. And it won: first place. It was announced in the plaza de armas of El Descanso; authorities were present. He felt happy but calm. She was happy. They received 450 Nuevos Soles to buy some things for their grandchildren. And they went on with their lives, selling cheese at ten soles a piece and watching how Yanaqocha began to transform the landscape: "This grass was not like this before. Because the qochita is providing moisture, it is this way: growing." ■

171 families in the Huacrahuacho watershed participated in two competitions "Ununchista Uywasun" (We raise water).



➤ Benefits of a gocha. Bernabe Huarca and Marcelina Huilca have just roofed their properties with ichu, which grows strong next to the family gocha.

➡ **Protected against water scarcity.** Setting up *qochas*, when combined with other measures, helps ensure that the most vulnerable population has access to water during drought periods.



➡ **Better with water.** This site is called Morogocha. Its construction has helped recover a neighboring bog and ensure the return of wild birds.

Water for everyone

In Pucacancha, they agreed to build a reservoir on a spot where they used to play football and graze their alpacas. This decision improved the environment and the lives of his community and neighbors.



► Sources of knowledge meet. Community leader Samuel Huarca (center) talks with Flavio Valer (left) in Morocacca. Flavio is an expert on qochas from PACC and Guillermo Taparaco is president of the community of Pucacancha.

The *qocha* Morocacca was born in the mountains, scraping the clouds, and is not just for one, but for all. It belongs to 150 families of the peasant community of Pucacancha, although it is found several hundred meters above the population center. This is a communal lake. It is the size of approximately two and half football fields and has the capacity to fit five Olympic pools, but could hold double this amount without risk because it isn't built in a gorge. Morocacca is a not just any reservoir: it is at the head of the Huacrahuacho watershed in Cusco at 4.373 meters above sea level. So if we think about it, its water belongs not only to those who live above but also to those who live below.

It was not easy to convince the community to build it, despite the fact that there was already a small *qocha*

on the site. Before this area was flooded, it was a green grass field where villagers took their alpacas to feed and where they used to play football at two in the afternoon after grazing the livestock. It was even less easy to explain to them that, through infiltration, part of the water would end up on the slopes below, far from their land.

—They weren't too sure about this part about sowing water —says Samuel Huarca, who is 50 years old. He is the president of Pucacancha and a rancher with cows, sheep and alpacas. Samuel participated in the first graduating class of Training Leaders for Climate Change— It wasn't hard for me to accept the idea. When I was a teenager, my dream was to supply water to my community. His friend Guillermo Taparaco, 44 years old

and communal president two years earlier, is also a rancher. Guillermo was just as clear as Samuel on this point: "Now the rain isn't normal anymore. It comes all at once and we have to deposit it in the lake. And then store it."

"The initial idea that we had with the *qochas* was to store water," explained Flavio Valer, specialist in Local Adaptive Responses from the Climate Change Adaptation Program in Cusco. "Later we proposed something more comprehensive: in addition to building dams and digging infiltration ditches, it was necessary to fence off the land and afforest. This is what they did with the hills that surround Morocacca. All the villagers from Pucacancha worked to enclosure the 54 hectares with poles and metal mesh. The alpacas would

no longer enter to graze. In addition, they planted species of native trees such as queñua, which uses 5% of the water required by a eucalyptus, as well as qolle and qishuar, the sacred tree of the Incas.

The landscape has changed inside and outside of the lake. Inside, birds such as the *ajjulla* or the *tagua gigante* nest. Outside, about four hundred meters below, water runs where there

used to be a wetland. The green color of the grass is telling. Even further below, there is a spring that provides drinking water to five communities. And Guillermo Taparaco wishes: "That by harvesting water, everything is green. And we have more income for our children, so that they don't end up like us and are better off instead. With this *qocha*, we are going to plant more grass and maybe we can even use it for crops." ■

Eleven communal micro dams have been built in Huacrahuacho. The enclosures have been closed temporarily and afforested with native species. Some of these areas have been declared communal reserves.

A person wearing a wide-brimmed hat and a red jacket is walking through a field of tall, golden-brown grasses. The person is seen from behind, moving away from the camera. The grasses are dense and reach up to the person's chest. The background shows a continuation of the field with some small green shrubs scattered throughout.

Natural pastures

The vast majority of the surface of Mollebamba and Huacrahuacho is covered by natural pastures. Overgrazing and intense rains have eroded and degraded the soil. One effective solution is to temporarily close off community lands to recover grass and seeds and increase water filtration.

— THE GUARDIANS OF THE PASTURES



In the communities of Mollebamba and Vito, they pamper the grass to combat climate change



OLLEBAMBA, APURIMAC. It's eight in the morning. It's cold because last night, rain fell in the form of snow. Five men arrive at a natural pasture 4,400 meters above sea level. Two are leaders of this community of 280 families. The other three are technical experts from the Climate Change Adaptation Program – PACCPeru. The site

is called Qocha Qocha and it is located three hours on foot from the village center.

Walking through a natural pasture in the Mollebamba watershed in Apurimac, or in the Huacrahuacho watershed in Cusco, doesn't feel strange. It is the predominant landscape—constituting 72% of the first's area and 87% of the second's—. But the pasture is in poor condition: overgrazing during the last twenty years has degraded the vegetation cover and the rains have eroded the soil. Here, almost all of the livestock production is based on natural grass. As such, it is indispensable to ensure that this resource is used properly. "In a water crisis scenario like the one we are living—from here to 2030, in highlands like these, the supply will fall by a third between July and October—it is important to work hard on the issue of natural pastures," explains Jaime Perez, advisor on local adaptation responses of PACC in Apurimac. He knows why: "It helps with water infiltration and recharges the aquifers."

It seems that this is what is happening in Qocha Qocha. Further below we can find Piscapuquio, the only source that irrigates seven agricultural sectors in Mollebamba. For this reason, the experts at PACC proposed to the community a plan to protect this pasture. This proposal was accepted at the

➔ **Defending the pastures.** Community leaders from Molebamba round up cows from a neighboring community that have invaded their protected communal pasture land.



➔ **Recovering the pastures in Hatun Casa.** Community leaders in Vito (from the left to the right: Nemesio Anamari, Pio Mendoza, Sozimo Zela and Demetrio Lladra), on the natural pasture where their community installed a mesh fence and afforested.

»» **A water sensor.** Further down from Qocha Qocha, in a weir, an automatic meter registers the surface flow every five minutes to monitor the amount water that can be attributed to the recovery of the natural pastures.

The key to success to recovering natural pastures is to develop community agreements about the maximum number of animals allowed per family and respect for protected areas.

assembly that is held once a month in the Plaza de Armas. "We decided to close off this area so that, over time, there would be more moisture," says Wilfredo Mancilla, who is 38 years of age and president of the community in 2013. Wilfredo, a natural leader from a young age, is aware that the weather is not the same anymore: "There are more droughts. How can we help change this? By sowing and harvesting water, planting trees at the head of the watershed or with enclosures like this one."

The process to place a mesh fence around Qocha Qocha took place during the first few months of Wilfredo's administration. They protected 34 hectares. All of the community's members participated over a two-day period. It was a big effort. They transported twelve big rolls of mesh and four hundred poles of eucalyptus wood through a gorge with a steep slope and up the mountainside. Secondary school students had already made holes to put the posts. At the end of the effort, they planted one thousand Queñua trees. From this point on, livestock would not be able to enter the area.

It is a few minutes after eight in the morning and it's still cold. Wilfredo is accompanied by the secretary of the current council, Renzo Delgado. When they are close to Qocha Qocha, they come upon a surprise: there is a herd of cows inside.

Someone does a headcount:

—Sixty-two!

"They must be from Mollojo, Antabamba", says Renzo, who is 34 years old. The inhabitants of this neighboring community have grown a habit of bringing their cattle to this pasture because it is close. "We will ask their authorities not to let their animals in here again. If not, the next time, we will take their cattle and they will have to pay twenty soles a head to get them back."

Wilfredo and Renzo, who are accompanied by the PACC technical experts, lunge at the cows, herd them toward the part of the mesh through which they had entered, and force them out of Qocha Qocha.

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The Climate Change Adaptation Program has intervened in five communities in this watershed: Mollebamba, Silco, Calcauso, Santa

Rosa and Vito. In Vito, where 235 families live, the program also made a targeted effort to protect grazing land. It couldn't be any other way: these families have ten thousand cows, sheep and alpacas. The villagers also know that only good grass produces good cattle.

Hatun Ccasa. This is the name of the place that the community assembly of Vito chose for the enclosure. It has 36 hectares and is close to the highway, a few kilometers from the village center, at 4,200 meters above sea level. Demetrio Llacta, who is 52, was president of the community when the area was fenced in at the end of 2010. Seventy-two members of the community, who were organized into six groups of twelve people each, participated in this communal effort. "It wasn't easy. The families that live close by have cows and sheep that used to graze there and they weren't in favor of the effort. But the community had already decided and they had to accept it." In Vito, unlike in Mollebamba, the objective was less about recharging the aquifers and more about recovering the vegetation, obtaining seeds of natural grass for replanting in eroded areas, and afforesting.

Nemesio Anamaria, who is 46, has held all of the positions on the local Conservationist Committee created by Agro Rural, a development program of the Ministry of Agriculture. Between the ages of 6 and 30, Nemesio lived in Lima "in San Juan de Miraflores, in the human settlement El Pacifico, block X, lot 3," and had returned to Vito with an idea: "Change people's attitudes. Little by little we are trying to escape the extreme poverty that has always been part of our lives." This Committee, with the help of PACC, was in charge of planting approximately twenty thousand pine trees and native trees—Chachacoma, Queñua, Qolle—, particularly on the slopes. For example, in Hatun Ccasa.

In the lower part of this area, a transformation has taken place, from a *layme* zone —rainfed lands that are farmed in a rotating way— to one under irrigation, by installing a sprinkler irrigation system. "We haven't used it yet," says Nemesio, "but we are thinking of using it this year. We are going to produce cultivated grass," such as white and red clover, Italian ray grass, alfalfa moapa, or supersonic. Pio Mendoza, who is 53 and currently president of the community, says: "In the next assembly, we are going to approve the use of pressurized irrigation." And when asked if this community is aware of climate change adaptation, he doesn't hesitate: "Yes. Today we know that to counteract change, we need to plant and recover the pastures." ■





➤ A negative change: Delays in sowing and harvesting, which are caused by variations in the rainfall pattern, increase the risk that frost will affect crops that have yet to mature.

➡ **A different kind of rain.** The residents of the Mollebamba watershed have observed that the onset of the rainy season has been delayed from September to December, which affects the agricultural calendar.



➡ **Taking care of mesh fences.** The former president of the Mollebamba community, Wilfredo Mancilla, and the current secretary, Renzo Delgado, survey the state of the temporary enclosure on the Qocha Qocha pasture.



When vegetables are welcome

Hundreds of villagers from the Huacrahuacho and Mollebamba watersheds bet on organic vegetable gardens cultivated with organic fertilizer and protected by trees. Healthy production for a balanced diet. Below, we present three stories of peasant farmers who have said 'ciao' to chemicals.

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'GREEN GOLD' TO CHANGE LIVES

If organic vegetable gardens are coupled with agroforestry, the future appears.

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BELINDA MANCILLA IS 48 YEARS OLD. Her life has taken a turn or better said, at least three turns. When her husband died and she was left to care for five children (Gisela, the twins Berly and Shirley, Thalia, and little Valentin). When she met Rufo Rea and they decided to build a new family. And when the Climate Change Adaptation Program – PACCPERU arrived in Mollebamba, Apurimac.

One day Belinda and Rufo, who is 50, heard about a competition for peasant farmers. It was called *Apu Ritt'i Raymi* (Festival of the Sacred Snowcapped Mountain) and its motto was *Yakuykirwan Kawasanchis* (Thanks to your water, we live). PACC, the civil association Pachamama Raymi, and the Municipality of Juan Espinoza Medrano had organized this type of competition with the idea that community members could learn about new climate conditions and adapt their livelihoods.

—Human beings do not realize that the climate is different—says Belinda—One has to adapt.

"Why did we opt for competitions?", Víctor Bustinza, deputy coordinator of PACC asks himself, "Because its methodology is to teach by doing. It is learning between equals, peasant farmer to peasant farmer. It provides an extraordinary level of trust. It isn't the engineer who arrives and intervenes." The efforts promoted agroforestry—a combination of trees and crops—the installation of organic vegetable gardens to produce vegetables naturally, organic fertilizer, the good use of water, raising small animals, and improving homes.

It was a success: the four competitions that were organized mobilized more than half the population of the Mollebamba and Huacrahuacho watersheds.

Belinda enrolled the family according to the competition's rules: "The wife signs up the whole family." And while they participated, she, Rufo and the children learned many things. They learned that planting bushes around their farm's perimeter reduces the effect of a frost. That having an organic vegetable garden with carrots, lettuce, white cabbage, chard, onions, radish or beets improves their nutrition. That combining these



➔ A new family. Belinda Mancilla, with her children Valentin and Thalia, and her second husband, Rufo Bea.

crops with fruit trees improves yield. That instead of feeding their guinea pigs with corn leaves and broom, it is better to do so with alfalfa. That using organic fertilizer made with rodent feces virtually doubles this fodder crop's harvest. That this production allows them to pay for their children's education in Lima, Ayacucho and Abancay: "El alfa—this is what they call alfalfa—is 'green gold'. Why didn't we plant this before?" And planting pine trees on their drylands will give them wood in the future. They did very well: they won the first place. Belinda received the prize of 400 soles as "household head and representative."

It is night time and Rufo, Belinda, and her daughter Thalia—who is visiting—have a glass of *ulpada*, with a bit of mote. They talk about the future. "The children will have income with these plants if they take care of them like we do. When we are old, they will have to recognize the sacrifice we have made," said the woman. The man nods. ■

Agroforestry deliberately associates trees or bushes in an agricultural system to obtain benefits for tree-crop interaction.

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TULA'S CORNER

Raising guinea pigs balances the diet and fattens the coffers (family)

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**T**ULA SANCHEZ'S PARCEL IS SMALL. Barely two hundred square meters. It is located in the village center of Mollebamba, Apurimac on a slope, about two hundred meters above her home.

—I have my little garden; I have everything right here —she says.

There is an organic vegetable garden with white cabbage, cauliflower, lettuce, broccoli, onions and carrots. But there are also potatoes. And corn. And grafted fruit trees, such as the pear, peach and quince tree. And a bush of golden berry or aguaymanto. And five intimpas, the tree of the sun, brought from Abancay. And flowers: carnations, San Jose, and morning glory, like the three she has attached to her hat. And aromatic herbs. And fourteen pine trees that surround everything, protecting it.

—Yes, this is my little corner.

The plot owned by Tula Sanchez, who is 48, also belongs to Cayetano

Guerrero, her husband, who is 60, although he works as the education coordinator of the district of Juan Espinoza Medrano and only goes to help in his spare time. When the Climate Change Adaptation Program – PACCPPeru began working in this community, Tula and Cayetano were interested: "Hopefully we can change something about the weather." They rolled up their sleeves. They attended various training sessions with expert peasant farmers. "They taught us how to optimize water" with sprinkler irrigation. They discovered agroforestry: "The more trees we plant around the farm, the less it is affected by the frost." They were told that chemical products are not used in the organic vegetable garden and that crops should be diversified and rotated. And the soil is improved with organic fertilizer. "Before, we didn't value vegetables too much. They are very good. More important than meat!"

PACC, along with the civil association Pachamama Raymi, also introduced them to Tula's passion: raising guinea pigs. Next to their farm plot, there's an adobe building with a calamine saddle roof. And right next to it, a shed where seventy rodents from the Peru and Inti lines run around in front of an old 25-inch television. And Tula puts so much passion into taking care



➔ It takes two. Tula Sánchez and her husband Cayetano Guerrero, on their exemplary farm. .

of these animals, that she sleeps in an adjoining room and not below, in her home. "I live and sleep up here because I have my little animals." So from the time she rises at five in the morning, she goes back and forth from her farm to the house and vice versa to cook breakfast, lunch or dinner, carry water or see if she children Gerso, 15, or Gualdis, 18, are studying.

—Competitions? Yes. We won a second place two times. With my guinea pigs, my homestead garden, and my fruit.

Although she can't calculate how much her economy has grown by raising these animals, she is sure that it has helped. For example, this year she has used eight loads of fertilizer prepared with guinea pig manure to sow her plot. Or if her children Beatriz or Abel, who live away from home, need money to pay the rent, she knows that she needs to sell, somehow, five or ten guinea pigs. "Before I looked at my husband's pocket and everything was about buying. Now I want to sell and produce more."

Every night Tula plans what she will do the next day. She has no doubt: at some point she will visit her farm plot. ■

Some families have built big hutches to raise guinea pigs on a larger scale. They guarantee production by growing alfalfa to feed their animals.



➔ **It's a family affair.** Beatriz Álvarez Rea, Tula Sánchez's mother-in-law, carefully braids her hair. On the next page, her daughter-in-law turns on the sprinkler irrigation system in her vegetable garden.



➔ **From Vito to Molebamba.** Antonio Anamária and Erosina Felicitas, with their daughter Diana. On the next page, Tula Sánchez with one of her guinea pigs.

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# THE HEALTHIEST FARM PLOT

*Community members prefer the sustainable fertility of organic fertilizers*

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WHEN YOU GO THROUGH THE ENTRANCE of Antonio Anamaria's property in Vito, Apurimac, everything seems to be in sync. The water runs rapidly through the canal next to a simple adobe home.

Antonio, who is 58, looks happy under his hat, with his white shirt with the number six on the back. He is working in one of the two organic vegetable gardens he owns, the one that is highest up, almost as high as the house's roof. This is where he plants vegetables. They also plant some trees, on the side that faces the hills, to halt frost and hail. The second vegetable garden, a few meters below, is much smaller and is ready for action: other vegetables wait their turn in the seedling nursery to be transplanted.

Antonio learned about this form of healthy farming through the peasant farmer competitions that were organized by the Program for Adaptation to Climate Change –PACC Peru, with the civil association Pachamama

Raymi, and the Municipality of Juan Espinoza Medrano. They promoted these efforts to balance the families' diets. In the highlands —this farm plot is 3,060 meters above sea level— the diet is low in vitamins and minerals; they consume many cereals and tubers and very few vegetables. "Before, we bought them in the store. But since I started planting them, we don't buy much."

His wife, Efrosina Felicitas, who is 46 years old, is sitting on the floor on a sheep skin and is working a backstrap loom. She weaves just how she learned from Gregoria, her sister-in-law, almost twenty-four years ago, when Efrosina was pregnant with her oldest child, Samuel. Now she makes ponchos, *llicllas* or covers and *chumpis*, which are the belts that men wear, upon request. And she does this from five in the morning until six in the afternoon, for a day and a half if it is a *chumpi* or three and a half days if it is a poncho.

Antonio and Efrosina's property is fertile. In addition to vegetables, it provides broad beans, potatoes, tarwi, corn, and native tubers such as oca, mashua, añu and olluco. The secret is in the organic fertilizer, which is



➔ **A valuable effort.** The quality of life of the Anamaria-Felicitas family has improved thanks to their vegetable garden.

another one of the things they learned. "I make it with stubbles, cow dung and guinea pig dung. And that is where the compost comes from. In three or four months, we will put it on the plants." If he doesn't prepare compost, he uses manure from his ten cows. Or worm humus, which takes advantage of these worms' digestive process. Or biol, which is a liquid fertilizer for leaves that is made with a mixture of feces, water, ashes, sugar, milk or whey, yeast, chicha, chopped alfalfa, and egg shells.

Three of their six children are on the farm plot: Diana, who is 10 years old and braids her mother's hair carefully, and Agustin, 16, and Paulino, 14, who break up the soil they removed with the *chaquitaqlla* several months ago to air it out.

"We are working so that our children have a better future. With the little bit that we produce, with the work we do to support ourselves, we are educating them," says Efrosina. And this is the way it is: Bernabe, 21 years old, studies in Lima, and Candy, 18, in Abancay. "With studies, our children will be better off." ■

Families can produce vegetables to diversify and balance their diets as well as improve their health.



Food security

Food security —stable production and access to food, and knowing how to use it— is a fragile concept if the climate takes a wrong turn. Some measures can guarantee food security: cultivating vegetables, even at very high altitudes, and promoting nutritional education, particularly for young children.

➔ Fun in the mountains. Various girls in the community of Santa Rosa play in front of the vegetable garden with a greenhouse that was installed next to their small school.



➔ Everything for their children: The women in the community of Kiana Hanansaya go to an early stimulation center that monitors the growth of children under the age of five.



— LETTUCE ON THE PEAK



Simple closed vegetable gardens with plastic roofs ensure that vegetables can grow at the highest altitudes



LETTUCE HAS ARRIVED AT SANTA ROSA, which is practically the “ceiling” of Apurimac, a department dotted with peaks and abysses. And they grow next to onions, white cabbage, carrots, broccoli and radishes. And Agustin and Magdalena, and their daughters, Kelly, Mery and Cris, were able to savor a beet for the first time. And they did this 4.600 meters above sea level, where the puna reigns and barely enough natural grass grows for the alpacas. And this was thanks to the vegetable gardens in greenhouses that were set up with the help of the Climate Change Adaptation Program – PACCPPeru, along with the Pachamama Raymi civil association and the Municipality of Juan Espinoza Medrano, to ensure that food is permanently available and to promote balanced consumption. That is, for food security.

Santa Rosa is a small community of alpaca farmers, the highest community of the Mollebamba watershed. It is made up of thirty families, who live a nomadic life in search of grazing areas. At the end of 2010, the farmers put together a community development plan with technical assistance from PACC. Additionally, they reflected on the impacts of climate change in their areas. Fifteen families decided to build small gardens to grow vegetables. This would allow them meet their food and nutritional needs despite extremely low temperatures. These areas would measure twenty-five square meters and would be surrounded by walls of stone covered with sheets of rigid plastic.

—Our ancestors ate what they produced here: meat, a bit of potato, corn and barley —says Agustin Lupa, who is 30 years old. He and his wife, Magdalena Paniura, who is 28, were enthusiastic about this idea.

The greenhouses take advantage of solar radiation to create a greenhouse effect under the roof and elevate the temperature. These greenhouses are useful where extreme climatic events limit crop production in the open air.

The proposal was simple: in the framework of peasant farmer competitions, interested families would have to make four walls; in exchange, PACC would provide wood for the roof structure and polycarbonate for the cover to ensure more durability. The sun's rays and the greenhouse effect would do the rest.

Agustin and his wife received assistance from Amilcar Aroni, Agustin's cousin. Together they practiced *ayni*, an Andean form of work based on reciprocity. It took two weeks to build the walls, and two more days to install the cover.

Three months later, something they never thought would be possible, happened: they had their first harvest of lettuce. Agustin remembers what he said to himself: "With this, I am going to be better off than I would be in the city." And he felt satisfied: "You consume what you produce, and everything is natural." They learned to prepare organic fertilizer. They had a lot of manure from 150 alpacas.

The lives of Agustin, Magdalena, and their three daughters, —Kelly, 10 years old; Mery, 8 years old, and Cris, 3 years old— have changed. Magdalena's life has changed because since this structure was built, she is the one in charge of the plants. The family's diet is different; it's healthier. The kitchen wall's of one of their cabins is adorned with a poster that they received from the program to remind them: "Balanced Diet."

The family economy has improved. "You can buy one head of lettuce for three or four soles. If you produce four or five lettuce, you have already saved twenty soles", calculates Agustin. "I can't remember the last time we bought vegetables in Calcuso", says Magdalena. On one occasion, Agustin went to this neighboring community to sell vegetables during the dry season. Lettuce from Santa Rosa? Unheard of!

This couple's example was replicated a few kilometers away on the plots of their cousins and *compadres*, Amilcar Aroni, who is 30 years old, and his wife Cleofé Huarcaya, 26 years old. "PACC provided guidance: 'You can build a greenhouse and have vegetables inside. This is good for you and your children.' And we wanted to do this." Agustin returned the favor and helped build and roof his vegetable garden.

And the little ones, Edison, who is 7, and Efrain, who is 4, love to eat the carrots so much that they barely let them grow. "Because they are good for eyesight, we eat more." And the lettuce too, although at first the flavor was foreign to them. And chard, which is fried with egg and flour.

Like other women in the community, Cleofé had to learn to cook vegetables that she was not familiar with, like beets. "I didn't know how it was done. So I tried. It was like a potato, so I figured it could be prepared like a potato."

They left off work at the greenhouse when Cleofé was pregnant with her third child. Now, three months after the birth of Max —who Cleofé



➔ Vegetables against the cold. The director and the students from Santa Rosa school in their vegetable garden.

carries in a wood cradle with a *lliclla*—, everything is already sown in the nursery and prepared for the next season.

*

In Santa Rosa, there is a vegetable garden with a very special greenhouse. This structure is on the grounds of Education Institution 54281, in the village center and an hour and a half on foot from any family's cabin. This is where Kelly and Mery study and Edison too. Every Monday morning they walk until they reach a pampa between the mountains, where there are one dozen adobe homes that are usually uninhabited, a medical post, which opens only ten days every month, and a small school painted red and yellow. Inside this school, there is only one room where eight more children sit.

Cirilo Cahuana, who is 33 years old, is their teacher and is also director of the center. He also looks after these children from Monday to Friday —during the week, they sleep in the village center so that they don't have to walk three to four hours back and forth every day—. "In this highland area, the greenhouse is very important. It helps us teach the children how to cultivate vegetables. They also have these structures at home, so they learn from this experience and apply it where their families live."

Cirilo didn't work in Santa Rosa at the time that the community agreed —along with the Municipality of Juan Espinoza Medrano and PACC—

to build this enclosed vegetable garden attached to the school's wall. The initiative included capturing water from a gorge and transporting it to the education institution as well as installing a hot water heater for the showers and sinks. The municipal authority provided the cement and the iron, the program supplied the polycarbonate sheets and the solar heater, and the families provided manual labor.

Three years later, the experience is very positive: the vegetables produced accompany the school lunches provided by Qali Warma, the National Program to Feed School Age Children, and the greenhouse effect that is produced in the vegetable garden helps to regulate the classroom's temperature making it less cold. This is also a teaching tool to talk to the children about the environment. "They know what it is and how to take care of it," explains Cirilio. "They tell their parents that they shouldn't throw plastic bags just anywhere in the wetlands because alpacas are raised in this area and if the water is contaminated, the animals are contaminated. And we are eating them."

So that they don't forget, on one of the classroom's walls, it says: *Pachamamanchikta munakusun*. We take care of Mother Earth. ■



➔ **Improving diets.** Magdalena Paniura in the kitchen in her house in Santa Rosa. On the next page, monitoring a child's weight in the early stimulation center in Kiana Hanansaya.



➔ **From Molllebamba to Huacrachuchó.** Mr. Cirilo Cahuana, a school teacher, and his student, Kelly Lupa. On the next page, the Lupa-Paniura family. Below, women and children from Kiana Hanansaya.

Songs for a pregnant woman

*Agu gu guawachay
suyasayki kusiskga
munacujg songoywan.*

*Taitayki munasunki
waykkeke suyasunki
cusiscca casayku
agu gu guawachay.*



< I'm expecting you happily / with lots of love. / Your daddy loves you / your brothers and sisters are expecting you / we're happy >

On a pampa in the community of Kjana Hanan-saya, Cusco, situated 4.000 meters above sea level, an L-shaped structure is found that is painted blue. Its façade is decorated with murals of children and posters that talk about foods that provide protection, give strength or aid in development. One poster says: Center of Community Oversight for the Health of Mother and Child.

Together with the communities and the Municipality of Kunturkanki, the Climate Change Adaptation Program – PACCPeru suppor-

ted the effort to create this center, to change the hard reality of the district: four of every ten children under the age of five suffer from chronic malnutrition. “Mothers with children in this age group come here,” explains the center’s coordinator, the nutritionist Evelyn Tuero, “to strengthen their capacities in health, nutrition and early childhood development.” This center is one of fourteen that were launched thanks to a Public Investment Project on food security in conditions of climate change. The project was

designed and implemented through a collaborative effort.

Yolanda Labra, who is 27 years old, and her cousin Victoria Mamani, 30 years old, have visited this center with their children since it was built, like many other women. Here, for example, they have learned the right technique for nursing, how to monitor their children’s growth, and how to balance their diets with quinoa and vegetables. “Before, we cooked only chuño with potatoes; no vegetables or meat were used,” says Victoria. “When we

are pregnant, we need to eat well to ensure that our children have the right weight and height,” said Yolanda, “and take vitamins, minerals, carbohydrates, and proteins.”

—I love to hear them talk about proteins and carbohydrates! —says Evelyn.

It is also a center for Early Childhood Stimulation, where the children develop abilities through games. “Some were not very sociable and little by little, began to play with others,” explains the coordinator. Ana Gualberta Mamani, who is 21, has three children: “I

have learned to manufacture toys with cans, bottle tops, and clothes. And Elvis, their father, teaches them about colors, numbers, painting, writing and playing.” And concludes: “They have changed us a lot.”



Jenifer Quispe, who is 30 years old, and her husband, Elio Ayala, 31, live in Pumathalla, Cusco 3.900 meters above sea level. They also believe in early stimulation and the idea that intelligence isn’t hereditary, it is built from the time that children are in the womb. They have



➔ **Breast feeding.**
Ana Gualberta Mamani breastfeeding her son Julio Roger, winner of the competition “Sumaq wayna ñuñuq” (Suckling baby).

In the district of Kunturkanki, fourteen early stimulation centers have been created. These centers monitor the height and weight of children under the age of five; encourage breastfeeding; and promote better diets in the home. They also help stimulate children’s abilities through games.

put this into practice with their three children: Edu, 8 years old, Esmith, who is 4, and Jemilder, who is one. “Edu began composing poetry when he was little,” says Elio. Now, he is “one of the best students in school, one of the class’s poets.” When they can, he and his brother Esmith recite poems to Santa Rosa of Lima or to the colors of the Peruvian flag.

Both these children had already been born when PACC arrived in the region. Only Jemilder had yet to arrive. His mother was able to stimulate him during the pregnancy. “This

is where the child begins to develop; to record things in his or her little brain”. She spoke to him. She sang to him that she was waiting for him happily, with a lot of love: “*Suyasayki kusiskga, munacujg songoywan.*” She played the radio for him. And went to see dances. Now Jemilder is a bright child who dances to the melodies that he “heard” and gets excited about the dances that he “saw.”

Twice a month, Jennifer and her children go to the Early Stimulation Center in Pumathalla, where they play with 20 other children. Since they decided that

this was too little time, they built a replica of this center in their home. Here, the children jump, sing, dance, throw stuffed animals or the ball and learn from their parents.

This is a model family. If one were to choose one from the 260 families in the community that represents the philosophy of adaptation to climate change, this would be the one. They converted their old one-room house, where everything was a mess, into a harmonious home with independent rooms situated around a patio: a kitchen, a bedroom, a stimulation

room and a storage area. The family added a garden to grow vegetables with which they were barely familiar. They have built five *gochas* or lakes, which recharge the springs, wet the grass, provide water to cattle and permit irrigation. They closed off grazing areas to facilitate infiltration from the rains and to be able to gather seeds, which they sowed in eroded areas. The family grazes their five cows and fourteen sheep in an organized way. Some of their stock grows so large and healthy that they win at cattle fairs. Elio is also a *kamayog*, an expert peasant farmer who shares

his knowledge with other farmers. He has supervised efforts to build seventy *gochas* and has participated, alongside one hundred men and women from Cusco and Apurímac, in the Training Program for Leaders in Climate Change. “My dream is to continue raising improved livestock, generate more income and ensure that my children study,” he says. “I want to have a bunch of *gochas* to have more water. I won’t let the rain go. I have to contain it here so that it stays here.” And knowing his determination and that of his wife, it will stay. ■

ESTIMULACION TEMPRANA



➔ **A special peasant farmer.** Elio Ayala walks along one of the five qochas for sowing and harvesting water that he has built on his property in the community of Pumathalla.



➔ **More water, more forage.** Jenifer Quispe, with little Jemilder on her back, grazes her Brown Swiss cows near her home thanks to the recovery of the pastures.

► **New learning.** Jenifer Quispe shares play time with her son Esmith in one of the rooms of her home, which is used exclusively for early stimulation exercises with her children.



► **Livestock prize.** Elio, Jenifer and their children Edu, Esmith and Jenilder, with their sheep Carlos and Chanchito, an enormous improved Corriedale that has won fifteen prizes.

Some grand houses

No more overcrowding and unsanitary conditions. Guided by this maxim, 425 families in the Huacrahuacho watershed revolutionized their habitat: they said goodbye to smoke with improved stoves and bet on adding more, larger and better rooms to their homes. Here are two exemplary cases of healthy homes.



RICARDINA'S MOTOR

Many women lead the process to transform old homes into healthier homes

EVERY MORNING, AT THE BREAK OF DAWN in the K'isco sector in Kjana Hanansaya, Cusco, the first thing that Ricardina Mamani sees when she opens her bedroom door is a mountain. It is Huaracani. It isn't particularly imposing and it isn't an apu, so no tributes are paid to it. But she likes it. Every morning, Ricardina Mamani feels happy. She has a good reason to be: she lives in Paradise. Not only because of the landscape. Look where you may look, everything is in balance.

The harmony felt by Ricardina, who is 34, and her husband Antonio Pucho, who is 35, and their twins Juana and Franklin, both 13, is no accident: it reflects the lessons they learned in peasant farmer competitions that were organized by the Climate Change Adaptation Program – PACCPPeru, in collaboration with the civil association Pachamama Raymi and the municipalities of Checca and Kunturkanki. Their home, which was built on a slope 4.100 meters above sea level, is healthy and exemplary. The rooms are independent: a smoke-free kitchen to prevent lung disease; two separate bedrooms for parents and children; a storage area for food; a production area to make cheese and yogurt; and a room for handicrafts. Everything is clean and organized.

It wasn't always this way: "It used to be a little hut where everything was together. It was dirty and disorganized. Our situation was sad." Ricardina remembers that the *kamayog*, peasant farmer experts and trainers during the peasant farmer competitions, encouraged her: "Friend, why can't you change your home?" And she did it, together with her family, working as a team, and driven by a tremendous capacity for work.

Her optimism and demand for a better world is plastered on every wall. Particularly at the main entrance, which opens up to a patio with green grass and rocks, where a sign reads: "Welcome to the Pucho Mamani's home." And inside, in a roofed area with a table and wooden stool, it says: "Rest, our visiting friend." And next to the water tap: "Drop by drop water disappears." On top of the children's door, it says: "Mother Earth is sick, let's save her." And over the door to the parents' bedroom: "Let's take care of the environment." And to the left of this sign: "If you want to listen to birds singing, plant a tree."

*

The change also brought them two gardens to plant vegetables—that they consume and sell to their neighbors— and medicinal herbs. They



➔ **Promised Land.** The vegetable garden in open ground, protected by a rock fence, has allowed the Pucho Mamani family to improve food production in terms of both quantity and quality.

also have a storage area where they produce vermicompost as fertilizer. And they have a nursery with tree seedlings of qolle, ceticio, quishuar and pine: "Every year, the plan is to plant one hundred more."

Here nothing is random. Following the advice of the *kamayog*, Ricardina and Antonio drew various talking maps on large pieces of paper to get a clear view of the present and to imagine the future. Their vision takes them into 2020, no less. On these maps, which are posted on the walls, one can see their three springs, which are surrounded by rocks to ensure that the cows don't damage them. The drawings also depict the ditches that they dug to help infiltrate rainwater at the high part of the slope, next to with the plot where they crop alfalfa and potato. And just below there are eight lots, or parcels, where their cows rotate to graze, to ensure that they don't run out of grass. "Before my cows died like this, becoming thinner and thinner. Not anymore." Everything that was drawn has come true.

If there is a special day for this family, it's Saturday. This is depicted on another speaking map. At seven at night, the directing council of the Pucho-Mamani family meets: Antonio is the president. His son, Franklin, is the secretary. Ricardina is the treasurer. Her daughter, Juana, is the auditor and supervises activities to make sure that they reach weekly goals.

—When we do things well, she doesn't tell us off. When we haven't done something, we hear about it —says Franklin.

—I make them pay fines for ten soles —confesses Juana.

They decide everything at these meetings: for example, to change the sheep—they had seventy, now they have six— for cows—which have gone from five to eleven, improved—; or how many cheeses or liters of yogurt they will sell at the market; or if handicraft production—sweaters, chullos, covers, or bags for cellular phones— continues at a good pace.

Ricardina learned her work ethic from her mother, who widowed and had to take charge of Ricardina and her nine brothers.

Her strength has been passed on to her children, who don't complain about having to walk four hours every day to and from Education Institution 56125 in El Descanso. Franklin—will be a veterinarian— and Juana— still doesn't know what she will study— guarantee the continuity of this great family enterprise: "My mom makes sacrifices for me and when she is old, it will be my turn. I have to make my best effort." ■



➔ A house that is more open. The room of the youngest ones in the Puchu Mamani family is now an independent, ordered and clean space.



➔ Production that sells. The new home has a room where Ricardina and her family prepare cheeses and yogurt to sell in nearby markets.

➔ **Balanced nutrition.** Both homestead gardens that were built to produce vegetables that protect plantings from frost and strong winds.



➔ **A house with a future.** The new healthy home owned by Ricardina Mamani and her husband Antonio Picho is the axis around which the family has built a sustainable life project.



THE FUTURE FITS ON A MAP

The projects for a new home drive families to seek a better life



SHE STANDS BARELY ONE METER FORTY. She can hardly see above her cows' backs. Her traditional outfit from Canas, with a green jacket and black embroidered skirt, isn't very large. Neither is her *montera* made of gold-colored strips. And all of this is not because of an insufficient or poorly balanced diet. Of course it isn't that. She has always drunk a lot of milk, eaten quinoa, huayro potato, olluco, chuño, rice, vegetables, meat, and even fish. The thing is, she is only fourteen years old.

—My name is Deisy Choquehuanca Zárate.

She lives in Tacomayo, Cusco, 3,940 meters above sea level, with her father, Benedicto, who is 38 years old, and his second wife, Berta Quispe, who is 36, and her brothers Alexis, who is 3, and Nayeli, who is 2. The Choquehuanca family is special. It is so special that it won first place in the healthy home category at one of the peasant farmer competitions organized by the Climate Change Adaptation Program-PACCPPeru, along with the civil association Pachamama Raymi, and the municipalities of Checca and Kunturkanki. And there is no one to guide around the house better than Deisy. For these purposes, she is tall. Immensely so.

An adobe wall surrounds the home. The door is made of green corrugated iron. There is a large square patio with rooms on three of its four sides.

To the left, there is a flirtatious kitchen, with drawings on the walls and a cupboard with four ceramic cups and five glasses: "Here is our fire. And the stove is on this side." It is an improved stove, with a flue for smoke.

To the right, there is a bedroom: "I sleep here with my little brothers." A piece of blue plastic separates their room from their parents'.

Toward the back and to the left, there is a production room: "This is where we make cheese, yogurt and menjar blanc."

Toward the back and to the right there is a room for handicrafts, games and a storage area: "Here is where my mother weaves. We rarely buy clothes now. I am learning but don't know much yet." And to one side: "Here is the room where my little brothers have fun with their toys." And over there: "Here is where we store our food. We produce the quinoa up there on the mountain, just like our potatoes. Here below, the frost comes and takes everything."

On the second floor, there is a living room: "Here my dad does his embroidery. We also watch television here, have fun and rest."

The exterior walls are painted red and have murals that talk about the environment. There are also various talking maps, which translate the family's lives into schemes.



➔ Family learning. Deisy is learning to weave in keeping with her mother's traditions.

One describes how they manage their cattle. After learning from PACC, they began to practice grazing through rotation, just like the other 216 families in the Huacrahuacho watershed. In this way, they protect the fodder oat and the improved grasses that they feed to their fourteen cows. These animals are essential to the family's economy: their milk is cheese and cheese is money; five soles per piece, if they take it to Checca, El Descanso, or Sicuani. Usually, they sell ten cheeses per week, but last year they sold up to forty. This is depicted on the business plan map.

But the most revealing map is the talking map of the future. On this map, they imagine a stable with a milking room; a mini-plant to process dairy products; a home with solar energy; and areas afforested *queñuas*. "This is what we think about."



Deisy is very responsible. Maybe she inherited this from her biological mother, Emperatriz Zárate, who died when Deisy was four years old. "According to my dad, she was one of the community's presidents."

Every day Deisy wakes up at four in the morning. She does her chores until six. She helps her other mother, Berta, cook breakfast. At eight, she walks for an hour with Rosa, Maribel and Jesusa, her best friends,

The families use talking maps to depict how they would like their home to look like, how they see the present and how they imagine the future.

to Education Institution 56128. She attends classes for five hours and learns from her teacher, Feliciano Mango, why, for example, the climate has changed —also, Deisy is a member of the school's ecology club. Deisy leaves school at two in the afternoon, with the exception of Wednesday, when she stays for band practice. Deisy plays the drum. After school, she walks for another hour. Once she's back, she grazes the cattle. Later, she helps make dinner. At seven, she studies. At nine, she shuts her eyes."

"I will be a lawyer," she says. Will I also graze the cattle and take care of the plants? "Maybe not." "And all of this?" "Maybe my brothers will continue," she says. "But I will always come back; I will never forget." "And will you fight for fair causes?" "Yes." And for a better world? "For my community and my district." ■



The adaptation competitions that were held among education institutions have generated exemplary cases. In the school of Vito, 48 students and 5 teachers grew vegetables in a vegetable garden, recycled waste, and disseminated their environmental message throughout the community.

Education





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THE FUTURE OF CHANGE

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*A small school in Vito becomes a reference point
for education about the effects of climate*

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**I**

**F YOU OBSERVE THE APU SAYWA FROM THE SKY**, you would say that someone has made an oblique cut in the enormous mountain and has removed a portion. On this impossible slope, which clings to a hillside known as el Calvario, you can find the small community of Vito. The landscape is eroded and only a eucalyptus woodlot stands over the village center. This is Apurimac, in the Molllebamba watershed.

Seen from above, only a dozen of more than hundred houses have a traditional roof made of ichu. The rest have corrugated roofs, which are tinged blue by the early morning light. Only three buildings have a different color roof, which is red. One of them, the largest of all the buildings in the area, is on the plaza de Armas. It is Education Institution 54264 in Vito.

—Welcome! —says Carlos Sánchez. He is 35 years old and is one of five professors, along with Mercedes, Fidelia, Modesta and Alzira. He has also been director since 2010.

The bell rings. Forty-eight students rush out of the classrooms, run down the stairs to a patio that is next to the school entrance, and line up. They are in uniform: a checked skirt for the girls, gray pants for the boys. All the children wear a dark blue vest with the school emblem and a light blue shirt.

A boy is singing. Two girls sing. Two children recite a poem: “Oh, environment/We remember you/with love/your children”, says one. Oh nature/ we will not pollute you”, retorts the other. This is not a random poem: it is their way of greeting the team from the Climate Change Adaptation

Vito's school won first place in two competitions "Pachamamapi sumaq kawsay (Living in Harmony with Mother Earth)," which were organized with local and education authorities.

Program-PACC Peru, which is visiting today.

The Vito school is unusual: it took the first place in the two *Pachamamapi Sumaq Kawsay* competitions (We live happily on Mother Earth), which were organized in 2011 and 2012 with the help of local and education authorities. Twelve education institutions from this watershed in Apurimac participated in these events: five from early years, five from primary school and two from secondary. "We sought to work on the subject of climate change, there where new citizens are educated," says Jaime Pérez, regional coordinator of PACC in Apurimac. "We thought it was necessary to educate them, develop their awareness and prepare them. They are the ones who will suffer the biggest consequences of climate change."

The environmental awareness of this institution is evident from the time you walk into the building. At the door Apuri Sánchez, who is eight years old, points out two drawings on large papers that are glued to a panel in the shape of a tree. One talks about the school before the competition: gray with no green areas. "It was ugly. As students we didn't feel motivated to study," says Apuri. Carlos Sánchez, next to being a director, is also his father, and is of the same opinion: "When I heard about this program, I asked them to help us make our school greener to improve the academic level. In an environment where there wasn't a single plant, the children and the teachers are not motivated."

The second drawing shows how it is now: pure color. You just need to tour the facility with the children. Leydy Llaccta, who is nine, is in charge of showing visitors the flowerpots: "We make them with paint buckets that are no longer useful." Now they have geraniums, *sunchu*, *oreja de raton*, and red carnations. "We have painted the flowerpots: Many flowerpots!", says little Araceli Castaneda, who is seven years old. One of the pots says "Respect me." "They respect the plants that live inside the institution and the ones outside as well. It is part of them; they themselves cultivate them." Or so says Alcira Zela, who is 30. She is a computer teacher, wife of director Carlos Sánchez and mother of Apuri and Nieves, who is three years old and still in preschool. Alcira is from Vito —her husband is from Lambrana, Abancay—; she studied in a school in the community. An enormous cypress remains from the old center.

The new institution is u-shaped, with a central patio and two levels. It is painted maroon and egg yolk yellow, and almost all of the walls have murals that have been done by the children, which carry slogans such as "We are an ecological family" or "We want to live all of life."

Upstairs, on the second level, is where the star attraction is located: the vegetable garden. Silvano Yucra, who is eleven years old, explains the preparation of the nursery: "We brought guano so that it would grow better and we planted seeds of carrots, lettuce, beets, spinach and radish." His brother, Cliberht, who is one year older, is the brigadier general of the environment. He was chosen by his classmates. All the children are



➔ This family is committed to the environment. Carlos, the school's director, along with Alcira, a computer teacher and Apuri, a student, ensure that the ecological messages on the school walls, are translated into real practices.

responsible for planting and watering. But he has to "respect all the plants and make sure that the other children don't damage them." This also goes for the green area in the back of the center. "Here, when we have recess, we lay down and rest," says John Meneses, who is nine.

Next to this rectangle of grass, there is a garden with medicinal plants. Allende Guerrero, who is nine years old, is an expert in *ruda*, Santa Maria, wormwood, and lemon balm. "This herb helps when you have a stomachache or headache. It is good for curing drunkards. You give it to them as mate and they stop drinking."

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Fidelia Sánchez is 26 years old and is a third and fourth grade teacher in the primary section. Like Carlos, the director, she is from Lambrana. She has fifteen students, who are eight and nine years old. She tells them:

—In today's class we are going to talk about how we use the materials that are contaminating our...  
 —...environment! —the children finish in chorus.  
 —What are these materials that we are throwing on the street? —asks Fidelia.  
 —Bottles! —says one.  
 —Cans! —shouts the other.  
 —Cookie packages! —says a third.

—And how can we use them? —asks Fidelia.  
 —As pencil cases!  
 —As brush holders!  
 —When we use the materials that are thrown on the street, like we are doing in our classroom, what are we doing?  
 —Reducing!  
 —Recycling!  
 —Reusing!

The three rs. This is the key, explains Fidelia.

What is done with waste in this school in Vito is so important that it has its own brigadier of recycling. His name is Julio Llaccta. His bangs are perfectly cut and form an arch around his forehead and the right side tip of

On the second floor, the school's star attraction is located: the vegetable garden. All children are responsible for planting and irrigating. The same holds for the green area in the back of the school.



➤ Theory and practice. Measuring rainfall is one of the activities that the students learn in their science classes. The children will later use this knowledge to give advice to their parents about agricultural activities.



The positive messages that are created in this education institution transcend the four walls of the school. Students broadcast information to the community through an on-site radio station.

the collar of his shirt is sticking up. This year he turned 12. "When I see my classmates throwing out trash, I tell them not to do it." It isn't only about stopping them from throwing it out; it's about giving new life to waste material. "We have to reuse it, insists Julio. Here they have good ideas about how to do so. He shows two simple examples. One: "We have wrapped this tuna can with paper and we use it to keep our eraser and pencil sharpener." Two: "We don't throw out our milk can, which comes from Qali Warma. We line it and use it to store our paints, pencils and rulers."

In the next classroom, Bruno Llaceta, who is 10 and brother to Brigadier Julio, proposes—in the name of his classmates—that the small plastic bottles be converted into brush holders for dental hygiene. That the large plastic bottles, cut in half, can be used as marker holders. That plastic bottle tops, both small and large, can be used to make an abacus. And a can, which is filled with soil, coupled with a wire, a CD and the upper part of a bottle, can become a decorative flower. In the last classroom, Apuri shows a first aid kit that they made from a cardboard box that had been thrown out; and Allende, who is the guardian of the medicinal herbs, shows how they can write the slogans that decorate the walls—for example, "We take care of our planet"—by gluing eucalyptus or horsetail seeds to the walls.

The positive messages that are developed in this institution are not confined inside the walls. One of the rooms, which is also a lunchroom for teachers, is used as a radio station for Radio Vito. In truth, the station

consists of a simple microphone that is attached to two speakers. Every afternoon, some students address not only to their classmates but also to the community's residents. "I talk about the environment," says Cliberht, the brigadier general. He tells them: "We shouldn't contaminate because the climate is becoming stronger. We need to take care of everything that is green." And Julio, the brigadier of recycling: "We shouldn't litter; we shouldn't contaminate."

Fidelia Sánchez, the teacher, is optimistic. "I see the students that have already left this school and they have a concept of the environment and transmit these habits. They are conscious of nature. Everything that has been done has been fruitful."

Jaime Pérez, from PACC, says: "All the education institutions have made good progress, but in Vito the teachers have been able to introduce issues relative to environmental education and climate change and have engendered a different attitude among the children."

Carlos Sánchez, the director, affirms: "In 2010 the children were shyer. Now they are not as tense and are freer. They are spontaneous. They explain the work they have done in the vegetable garden. And they like it. "Has there been a change? Yes, in their self-esteem." ■



➤ Reduce, recycle, reuse. Fidelia Sánchez, a teacher, in her class about the environment.

# *Technical files*





# Qocha, System to store surface and sub-surface water

## 1. DESCRIPTION OF THE PRACTICE

A Qocha<sup>1</sup> is a manmade water deposit or reservoir that takes advantage of a natural depression in the land (hollow) or a natural lake to boost the recharging of local aquifers, which feed the springs below. For this purpose, a compacted earthen dam is built to capture and store the rain water that runs off the surface and/or from a nearby spring. The bottom area and the channels that are used for collection and/or derivation purposes, are not made impermeable so that a percentage of the water infiltrates and recharges the aquifers. Some information: a qocha of 3,000 m<sup>2</sup> can infiltrate

5,000 m<sup>3</sup> of water in the 5.5 months that the rainy season lasts, given an infiltration rate of 0.01 m/day (Pumayalli, 2013: 44)

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS AND THE CAUSAL CHAIN

Water sources diminish, which makes water scarce during the dry season for both agricultural use and human consumption.

## 3. OBJECTIVES OF THIS MEASURE

- Capture and store rain water on the surface for direct use, to irrigate pasture, and provide water to cattle.
- Infiltrate water and recharge aquifers, improving

water regulation services.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

- Reappearance of or increase in the flow rate of spring waters below.
- Appearance and development of natural grasses and palatable species at the foot of the dam and downstream of the micro dam (recovery of the pasture).
- Possibility of deriving and using part of the water to irrigate bogs and boost the growth of natural pastures.

## 5. CO BENEFITS

- Moderates the microclimate in its surroundings and generates more moisture, which allows native

vegetative associations to grow, improve the vegetation cover and increase the vegetation biomass.

- Helps conserve and extend biodiversity: species of fauna and flora, which grow in lakes and wetlands.
- Improves the landscape.

## 6. COST (MANUAL LABOR AND/OR INPUTS)

PACC's experience has shown that on average, 8 days of work are needed to build a micro reservoir of 80 m<sup>3</sup>, which costs 240.00 soles.

## 7. MAIN REQUIREMENTS

- Adequate topography: a soft depression, not in water courses or in gorges.



- Adequate soil texture: permeable, connected to the springs below or impermeable in the case that the objective is to store water
- Family and communal agreements to build on shared lands.
- Availability of materials: rock, clods of soil (sods) and clayey soil.
- Caution with potential risks that may be generated downstream by infiltration and/or water stored by the dam.

## 8. RECOMMENDATIONS

- Do not build in zones with steep slopes or fast running waters such as gorges or natural water courses.
- Do not store an excessive volume that generates

the risk of overflow or a collapse of the dam.

- Avoid using cement or heavy machinery to maintain the original soil characteristics.
- Do not use as a watering hole for animals, which may cause contamination and destroy the soil.

## 9. COMBINATION / INTERACTION WITH OTHER MEASURES

- Afforestation with native species.
- Enclosure of natural pastures.

## 10. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

In the Huacrahuacho and Mollebamba watersheds, changes are occurring in

precipitation and temperature patterns. In Huacrahuacho, precipitation is following a downward trend while the thermal range increases (the maximum temperatures increase and the minimums decrease). The variation in precipitation patterns and environmental deterioration in this territory are causing water sources to decline, as is the case in other high Andean watersheds. According to climate change scenarios for 2030, this trend will continue upwards. The qochas help recharge the aquifers and facilitate water storage, which contributes to ensuring that water resources are available year-round. This helps to recover ecosystem

services, such as hydrological services, biodiversity, micro climate generation, and strengthening social relations between families and communities.

## 11. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba.

Pumayalli, R. 2013. Estudio de la capacidad de almacenamiento de las qochas familiares y sus contribución a la recarga de los acuíferos en la microcuenca Huacrahuacho. PACC. 70 p. ■

<sup>1</sup>The term *qocha* is used to refer to various structures (rustic micro reservoir, natural lake, artificial lake, etc.), depending on the zone. In our case, it refers to a rustic micro reservoir that has the characteristics indicated in the text.



# Rotational Grazing and Temporary Closure of Grazing Areas

## 1. DESCRIPTION OF THE PRACTICE

Grazing control and management is fundamental to improving the soil's capacity to infiltrate rain water and store water in the sub-soil. In a rotational grazing system, cattle is systematically moved from one pasture unit to the other based on a rotation schedule. Cattle rotation depends on the pastures' intervals of supportability, the livestock demand, the speed with which pastures recover and

the seasons of the year (IMA, 1999). It is fundamental to respect family and communal agreements regarding territory use. To divide and protect pasture units, rock walls, wire or mesh lines, or electric fences are used.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

- Overgrazing (erodes, reduces infiltration and increases surface run-off).
- Degradation of the vegetation cover.
- Water and wind erosion.

- Loss of agrobiodiversity (palatable species).

## 3. OBJECTIVES OF THIS MEASURE

- Improve the vegetation cover, reducing erosive processes to increase water infiltration in the soil.
- Develop and preserve reserve pastures for months when grass is scarce.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

- Improved the quality of grass and livestock nutrition.

## 5. COST TO IMPLEMENT THE MEASURE (MANUAL LABOR AND/OR INPUTS)

Total: S/. 5,140 nuevos soles per hectare, materials: S/. 3,220, manual labor S/. 1,920 per hectare.

## 6. MAIN REQUIREMENTS

1. Determine the supportability of the grass (carrying capacity).
2. Organize a communal committee.
3. Conduct a census of the livestock.



4. Put together a rotation calendar.
5. Establish a family agreement and communal agreements about the maximum number of animals/family, carrying capacity of communal areas, and respect the temporary closure of areas.
6. Oversight to ensure compliance with the agreements.

## 7. RECOMMENDATIONS

1. Ensure that the number of livestock does not exceed the pastures' carrying

2. Avoid micro-parcelling of grazing areas.
3. Strengthen the communal organization to guarantee that the rules are respected and prevent unequal or unjust use of communal resources.

## 8. COMBINATION/ INTERACTION WITH OTHER MEASURES

- Infiltration ditches.
- Rustic micro dams.
- Reforestation (silvo-

pastoral systems).

## 9. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

Recovering the vegetation cover is a main priority in climate change adaptation, given that it favors infiltration and water retention at the soil level, which conserves moisture for longer periods of time ("sponge effect"). This improves water regulation services in watersheds, which in term attenuates peaks in the flow when rains occur and increases the

flow during dry periods. Adequate management of pasture areas also improves the carrying capacity, which in turn leads to improvements in the system to raise animals and strengthens food security while boosting income.

## 10. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba.

Instituto de Manejo de Agua y Medio Ambiente. 1999. "Manejo de praderas naturales altoandinas, la experiencia del anexo de Mayubamba en la Comunidad de Cucuchiray, Provincia de Paruro". 78 p. Disponible en [http://www.ima.org.pe/publicaciones/experiencias/PUB\\_mayumbamba.pdf](http://www.ima.org.pe/publicaciones/experiencias/PUB_mayumbamba.pdf). ■



# Agroforestry

## 1. DESCRIPTION OF THE PRACTICE

Agroforestry entails the deliberate placement of trees and bushes in an agricultural system to obtain benefits from tree-plant interaction. Agroforestry practices refer primarily to the construction of live fences with species of bushes and trees that are arranged around the plots to protect them from cattle intrusion, strong winds, and brusque temperature variations

(MST, 2010). The most common forest species include: queñua, qolle, retama, mutuy, quishuar, chachacomo, aliso, chilca and capuli. Fruit trees can also be used in intermediate zones.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

- Brusque microclimatic changes (frost, wind, direct radiation, etc.) that affects food production, reducing food security of

families.

- Erosion and degradation of soil fertility.
- Deforestation.

## 3. OBJECTIVES OF THE MEASURE

- Create microclimates, protecting crops against frost and wind and providing shade to small areas for animals.
- Control erosion.
- Improve soil fertility.
- Improve the soil's water retention.

- Produce firewood and other wood-based products, fruit and fodder.
- Increase biodiversity (fauna and flora).
- Increase crop yields.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

1. Families perceive that the integration of tree species has helped protect crops from strong winds (trees act as a windbreaker)

PACCPeru



2. Fruit trees provide food for consumption and to complement income.

## 5. COST (MANUAL LABOR AND/OR INPUTS)

The approximate cost of each seedling is S/. 1.20 nuevos soles.

## 6. MAIN REQUIREMENTS

1. Design the parcel and

2. Acquire seedlings for trees and/or bushes.
3. Prune and manage pests.

## 7. RECOMMENDATIONS

1. Choose the right species, which are appropriate for the Andean highlands.
2. Ensure that the species and plants are complementary, meaning they do not

3. Include fruit trees because they provide food.

## 8. COMBINATION / INTERACTION WITH OTHER MEASURES

- Qochas.
- Closed-off pastures.

## 9. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

Agroforestry can

reduce the vulnerability of production systems in the face of climate variability in the present and the future. The main improvement is the protection that the trees provide against extreme climate events, such as frost and strong winds. ■



# Organic Fertilizers

## 1. DESCRIPTION OF THE PRACTICE

Organic fertilizer is made with animal dung, vegetable food residuals, residuals of edible mushrooms or other organic and natural sources. Ecological agriculture places great importance on this type of fertilizer given that it reduces the dependence on artificial chemical products for different crops and significantly reduces costs.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

Soil fertility reduction for different reasons, such as:

- Insufficient crop

rotation.

- Not enough fertilizer is applied on cropped areas, insufficient to replace the harvested matter.
- Lack of awareness of new fertilization techniques that use local inputs.
- Fallow period of parcels is reduced.

## 3. OBJECTIVE OF THE MEASURE

- Increase the soil organic matter content, boosting fertility and the capacity to retain water.
- Stimulate microbial diversity and activity in the soil.
- Improve the soil structure.
- Improve soil's overall

porosity to ensure better water penetration and root growth.

- Improve the plant's general state of health.
- Increase yields and product quality.
- Lower production costs.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

The families are fully aware of the need to replace the soil's organic matter and understand the positive impact that this practice has on crops because::

- Improves food production in terms of quality and quantity.
- Maintains soil moisture.

## 5. COST (MANUAL LABOR AND/OR INPUTS)

Biol (40 l): 94 nuevos soles (inputs 64, manual labor 30),  
Compost (100kg): 107 nuevos soles (inputs 32, manual labor 75),  
Hispachisqa<sup>1</sup>(1 ha): 348 nuevos soles (inputs 48, manual labor 300)

## 6. MAIN REQUIREMENTS

The process to make organic fertilizers requires temperature and moisture control as well as soil aeration. There are different types of organic fertilizers, according to their preparation:

- Manure, which is made



from fermented animal dung. It has high levels of nitrogen although its properties vary greatly depending on the animal which produced the dung and the food that it consumes. Manure can be from cows, sheep, guinea pigs, alpaca, or hens.

- Compost, which is obtained from controlled decomposition of organic residuals, particularly from vegetable sources.
- Worm humus is compost that is made through the digestive process of worms. It is clean, odorless humus that is soft to the touch. Its properties are even better than those of domestic compost.

- Biol, which is a foliar fertilizer that is obtained through an anaerobic decomposition of organic wastes; there are various formulas to enrich this product.

## 7. RECOMMENDATIONS

- It is necessary to conduct careful monitoring of the fertilizer elaboration process; poor management can generate sources of pathogens and contamination.
- Training should not only focus on the production stage; it is important to include methodologies for applying fertilizers to crops.
- Foresee that a lack

of inputs (in case the families do not possess animals) and the work required to make fertilizer, may lead farmers to abandon this practice, particularly if the family is involved in different non-agricultural activities.

## 8. COMBINATION / INTERACTION WITH OTHER MEASURES

- Installation of vegetable gardens.
- Cultivated grass.
- Raising small animals.

## 9. PERTINENCE OF THE MEASURE TO CLIMATE CHANGE ADAPTATION

Organic fertilizers improve the soil structure, increasing

the capacity of infiltration and water retention, particularly in conditions of higher temperature, and therefore higher evapotranspiration and higher variability in precipitation. Adequate soil fertilization makes sure the plant's less sensitive to extreme climate events and to plagues and diseases associated to higher temperatures and more or less precipitation. In the case of biol, it revitalizes plants that have suffered stress, whether due to pests, diseases, droughts, frost, hail, or interruption of the

normal plant processes and requires timely, sustained and adequate application.

## 10. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba. ■

<sup>1</sup>This local practice for fertilizing grass consists of having cattle sleep for a maximum of two nights in a fenced off area to concentrate the animals urine and manure in this limited area; the parcel is then watered. The practice of hispachisqa contributes organic matter and urea to the soil.



# Local Climate Monitoring

## 1. DESCRIPTION OF THE PRACTICE

Climate monitoring entails the systematic reading, registering, data gathering, ordering and analysis of the values of meteorological variables such as precipitation, temperature, wind speed and direction, relative humidity, evapotranspiration, atmospheric pressure and solar radiation. These tasks are performed using instruments at meteorological stations. This monitoring gives inhabitants access to information on local weather conditions in real time and follow its changes.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

Inexistence of climate information at the local level, particularly in the Andean highlands.

## 3. OBJECTIVE OF THE PRACTICE

Have quality information at local level to improve knowledge about variability and climate change and its monitoring.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

Local meteorological information is available to families and the

municipality for decision making purposes.

## 5. COST (MANUAL LABOR AND/OR INPUTS)

Manual station: S/. 21,162 nuevos soles.  
Materials: S/. 7,512 nuevos soles.  
Equipment: S/. 11,000 nuevos soles.  
Manual labor for installation: S/. 3,100.  
Operation: (3 readings a day), S/. 200 nuevos soles a month.

## 6. MAIN REQUIREMENTS

1. Define and reach a consensus agreement

with local communities and governments regarding the need for and benefits of setting up a meteorological station for local climate monitoring.

2. Sign agreements with local and national institutions for advisory services to install and operate the station.
3. Purchase and install equipment.
4. Train community leaders to read the weather.
5. Registry of weather data.
6. Processing and interpretation of



weather data.

7. Commitment of local institutions to ensuring on-going data taking and equipment maintenance.
8. Disseminate weather information through local radio stations.
9. Deliver weather data to pertinent institutions.

## 7. RECOMMENDATIONS

• The meteorological station should be installed in the correct location and according to technical norms to ensure that the equipment is protected and safeguard the quality of the data.

• Weather data should be registered and read on a permanent basis.

## 8. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

It is important to conduct and maintain a systematic registry of the behavior of meteorological variables at the local level, which allows us to: i) generate a solid local information base that facilitates analysis, interpretation, forecasts and in the future, helps generate local scenarios that are useful at the productive and social level, ii)

validate and complement the results of climate research that have been conducted at the local level with information that was extrapolated from nearby stations, iii) feed local meteorological information into larger climatic information systems and iv) feed Early Warning Systems (SAT) that facilitate response to extreme climatic events.

## 9. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac.

Caso de las microcuencas Huacrahuacho y Mollebamba. CONAGUA, 2014. Glosario. Disponible en : <http://www.conagua.gob.mx/Contenido.aspx?n1=3&n2=60&n3=89>

The Globe Program, 2014. Disponible en: <https://www.globe.gov/>



# Promoting Early Childhood Development

## 1. DESCRIPTION OF THE PRACTICE

Early Childhood Development is a comprehensive set of systemic and integral interventions in education, nutrition, health as well as emotional and social stimulation for boys and girls between the ages of 0 and 5. The specific activities that were conducted:

- Early stimulation.
- Breast Feeding.
- Monitoring of Growth and Development – CRED.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

This activity is meant to address the structural conditions that make boys and girls more vulnerable

to the effects of climate change, such as:

- Chronic malnutrition in boys and girls under six months of age due to the early incorporation of water, mate, soft drinks, cow's milk and solid food during the breast feeding period<sup>1</sup>.
- Lack of access to services and training to take care of and provide early stimulation to boys and girls under the age of three, which causes delays in psychomotor<sup>2</sup> and language development as well as social skills<sup>3</sup>.

## 3. OBJECTIVE OF THE ACTIVITY

- Strengthen the capacities to care for and protect boys and girls under the age of five to reduce the incidence of chronic malnutrition.

- Promote growth and optimum development that is in line with the chronological age of boys and girls under the age of five.
- Strengthen the family and community and public institutions with regard to taking care of and protecting boys and girls under the age of five.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

- The families, facilitators, kamayoq, technical experts and promoters that work to implement practices, value the fact that children are being cared for and prepared for the future.
- The communities are incorporating practices to monitor growth and development (CRED)

and early stimulation with the support of local health promoters.

- Families believe that well nourished children that receive adequate stimulation are protected against illnesses and moreover, develop their intelligence to better take advantage of their studies.

## 5. CO-BENEFITS

- Improves school performance.
- Strengthens food security of boys and girls under the age of five.

## 6. COST (MANUAL LABOR AND/OR INPUTS)

Implementation of an early stimulation center: S/. 5,850 nuevos soles.  
Implementation of a center for monitoring Growth and Development CRED: S/.



2,000 nuevos soles.  
Breast Feeding Campaign S/. 2,500 nuevos soles.  
Payments for technical personnel who provide advisory services (per district per year): S/. 45,000 nuevos soles.

## 7. MAIN REQUIREMENTS

1. Families' willingness to prioritize the care and protection of boys and girls at home and in the community.
2. Equipping services (state) for early child care.
3. Availability of specialized personnel to care for and protect boys and girls under the age 5.
4. Training parents in the different components of Early

Childhood Development (ECD).

5. Willingness of local public institutions to coordinate and articulate actions.

## 8. RECOMMENDATIONS

- The practices can be reinforced at home by implementing an adequate room for the development and control of children.
- It is important to consider the level of education of father and mother, to define the best strategy.
- It requires trained technical staff to accompany the customized activities of parents to promote ECD.

## 9. COMBINATION WITH OTHER PRACTICES

- Improving housing.

- Family vegetable gardens.

## 10. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

Climate change affects human development in a differentiated manner, with largest impacts on the poorest sectors of the population, and within them, in boys and girls, who are among the most vulnerable social groups. The measure seeks to help bridge the social gap, taking action to strengthen the capacities of parents of children under five, in order to reduce the vulnerability of the generation that will have to face the greatest impacts of climate change that is come in the future.

## 11. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba.  
  
Norma Técnica de Salud para el control de Crecimiento y Desarrollo de la niña y niño menor de 5 años. R.M. N° 090-2010 MINSA. Disponible en: [http://www.midis.gob.pe/dgsye/data1/files/enic/eje2/estudio-investigacion/NT\\_CRED\\_MINSA2011.pdf](http://www.midis.gob.pe/dgsye/data1/files/enic/eje2/estudio-investigacion/NT_CRED_MINSA2011.pdf)  
OMS: Estrategia mundial para la alimentación del lactante y el niño pequeño. Ginebra: Organización

Mundial de la Salud; 2002. Disponible en: [http://www.who.int/nutrition/publications/growth\\_infant\\_feeding\\_text\\_spa.pdf](http://www.who.int/nutrition/publications/growth_infant_feeding_text_spa.pdf)

<sup>1</sup>This damages their digestive system and does not contribute all the nutrients children need to grow and develop in age-appropriate ways. Mothers do not know how to detect chronic malnutrition in their children on time.

<sup>2</sup>The workload in rural areas and the lack of knowledge of fathers and mothers about the importance of stimulating growth and development, also causes motor skills (crawling and walking) of boys and girls to be lower.

<sup>3</sup>This makes boys and girls timid, fearful and likely to reject interpersonal relations with people outside the family because their communication skills are very limited, which causes learning difficulties in school-age children.



# Vegetable production in homestead gardens

## 1. DESCRIPTION OF THE PRACTICE

Vegetables are an important source of food for peasant families due to their nutritional value, which is high in vitamins, vegetable proteins and minerals. These elements are indispensable for children's growth and development, prevent diseases and ensure that the family's diet is healthy. The main obstacle to vegetable production in the Andes are brusque changes in temperature. One way of reducing these risks is by installing vegetable gardens with a greenhouse (with walls made of adobe or rock and a roof made of agricultural plastic or polycarbonate sheets) to create a favorable artificial microclimate. Other

ways include installing vegetable gardens in open fields with rock fences (the absorb heat during the day and release it at night); or live fences (placing bushes around the perimeter as hedges). These vegetable gardens could also be set up on a field area that is 0.50 m deep to create a thermo regulating effect.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

- Unbalanced family diet based on carbohydrates and lacking in vitamins and minerals that generates malnutrition and leads to the risk of chronic childhood malnutrition.
- Drastic climate conditions in highland areas make it difficult to produce vegetables.

## 3. OBJECTIVES OF THIS PRACTICE

- Promote healthy nutritional habits through fresh vegetable consumption.
- Improve health and prevent diseases by consuming vegetables as a source of vitamins, minerals and vegetable proteins.
- Improve vegetable management in family gardens with technology that is innocuous for the environment.
- Have frequent access to vegetables due to their short growing seasons.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

Families clearly identify the benefits of consuming vegetables in a healthy diet for their children and

the family:

- Before, they had to buy vegetables. Others, due to lack of knowledge about their nutritional value or limited funds, did not purchase vegetables. Today, they produce vegetables in their gardens.
- A menu that includes fresh and varied vegetables on a daily basis contributes to a balanced diet and as such, helps prevent illness.
- Vegetables can be produced year-round if they are cared for and protected.
- Production is destined to consumption and commercialization (surplus production).
- Including vegetables in the family diet is valued by the health service, as it means increasing the consumption of vitamins and minerals.



## 5. CO-BENEFITS

Families make income when they sell the surplus.

## 6. COST (MANUAL LABOR AND/OR INPUTS)

Installing a vegetable garden in an open field: S/. 705 nuevos soles.  
Installing a green house: S/. 1,247 nuevos soles with agricultural plastic and S/. 2,020 nuevos soles with polycarbonate sheets.

## 7. MAIN REQUIREMENTS

1. Have access to water to continuously irrigate the vegetable garden.
2. If possible, choose a location that is protected from the direct rays of the sun, winds, frost, hail, snow, etc.
3. Prepare the land.

4. Have manual labor on hand to take care of the garden.
5. Have materials for the fence (in the case of vegetable gardens in open fields) and/or materials for the roof (in the case of vegetable gardens with greenhouses).
6. Have the means to buy vegetable seeds.

## 8. RECOMMENDATIONS

- Use biological means to control pests and diseases to maintain the natural balance of the environment without producing toxicity or totally eliminating the species.
- Provide permanent care for vegetables.
- Use organic fertilizer produced locally to fertilize the soil.
- Apply staggered sowing

of vegetables and combine them with aromatic and/or medicinal plants.

## 9. COMBINATION WITH OTHER PRACTICES

- Production of organic fertilizer.
- Promoting a varied and balanced diet.
- Agroforestry (in some cases, vegetable gardens in open fields are combined with fruit tree and/or bush planting to protect against winds).
- Healthy homes.

## 10. PERTINENCE OF THE MEASURE WITH REGARD TO ADAPTATION TO CLIMATE CHANGE

Climate variability has worsened, which has led to crop and livestock losses. Producing vegetables in

a way that protects them from climatic extremes is a complementary alternative that allows the families to have a consistent supply of food. Using organic fertilizer to produce vegetables improves the soil's structure and ability to retain moisture; reduces the crops' irrigation water demand; and helps the plants' roots absorb nutrients and water. Higher quantities of organic matter strengthen plants and increase crop yields. All of these aspects are important in contexts that experience a lack of water, frosts and hail.

## 11. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas

de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba. ■



# Raising small animals

## 1. DESCRIPTION OF THE PRACTICE

The measure consists of promoting traditional practices of raising guinea pigs in rural homes, with the aim that the production is mainly used for home consumption.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

- Protein deficit, chronic malnutrition and anemia make the families, and boys and girls in particular, more vulnerable to the effects of climate change.

## 3. OBJECTIVES OF THE ACTIVITY

- Promote the

consumption of food products of animal origins that have a high nutritional value.

- Strengthen the revaluation of Andean products in the family diet.
- Contribute to timely prevention of chronic malnutrition in boys and girls under the age of three.

## 4. BENEFITS CONFIRMED BY THE FAMILIES

- Families clearly identify the benefits of a varied diet.
- The high nutritional value of guinea pig meat is well known.
- Guinea pigs reproduce easily and in less than a year, it is possible to

triple production and permanently improve the breed.

## 5. CO-BENEFITS

- Guinea pig production is more valued at the commercial level (sales) given that it generates income progressively.
- With the sale of surplus guinea pig production, it is possible to make money quickly.

## 6. COST (MANUAL LABOR AND/OR INPUTS)

The cost of production for home consumption is marginal and limited to the purchase of a reproducer guinea pig(s). This type of

small-scale animal raising is customary in peasant families.

## 7. MAIN REQUIREMENTS

1. The families must have time to take care of, feed and permanently clean the area where guinea pigs live.
2. Have land to grow grass and space in the home to build hutches or pits.
3. Accede to and receive training and technical assistance regarding sanitation, procreation, selection and breeding guinea pigs.
4. Use materials from the area to install



hutches and/or pits according to technical instructions.

5. Have resources to buy reproducer guinea pigs and preventive medicine to initiate production.

## 8. RECOMMENDATIONS

- It is important to have access to knowledge about practices for guinea pig raising.
- The installations must be permanently maintained and cleaned.
- Foresee an initial investment to buy reproducers.
- Set aside land nearby to grow fodder grass (to feed the guinea pigs).

## 9. COMBINATION OF OTHER PRACTICES

- Cultivate grass.
- Sprinkler irrigation.
- Home improvement: differentiated spaces for the guinea pigs.
- Recovery of natural pastures.
- Systems to store surface and sub-surface water for grass production.

## 10. PERTINENCE OF THE ACTIVITY TO CLIMATE CHANGE ADAPTATION

- Unlike livestock rearing that destroys natural pastures, guinea pig raising represents an environmentally friendly practice given that it is

intensive and does not affect vegetation cover.

- Given that agro biodiversity has declined and food production in the rural ambit has fallen due to the impact of climate change, guinea pig raising constitutes a food alternative with a high protein content.
- This allows families to diversify their income so that they are not solely dependent on activities that are highly sensitive to climate variability and change.

## 11. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio

climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba.

Quispe, M. Folleto Manejo de animales menores cuyes con énfasis en etnoveterinaria. HEIFER International Peru. Cajamarca – Peru. 15 p. Disponible en: <http://www.heiferperu.org/site/images/stories/documentos/manejoanimalesmenores.pdf>



SCALE  
Family



ALTITUDE

The measure extended to all of the communities (at different altitudes) in the Huacrahuacho and Mollebamba watersheds and can be used in any rural area in the Andean highlands.

# Healthy Homes

## 1. DESCRIPTION OF THE PRACTICE

The practice related to healthy homes is based on the concept that health is a fundamental human right, which is reflected in a good state of physical, mental and social well being. Under this perspective, health is quality of life and housing conditions are recognized as one of the main social determinants of human health. As such, the concept of healthy homes entails actions to prevent illness and improve families' health while increasing the physical security of their homes and improving their emotional health.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

- Poor location and positioning of the home

in terms of the sun's direction, filtrations of humidity and wind.

- Inadequate functional distribution of the home means that the families do not live comfortably or safely, which leads to overcrowding (people and animals) and subsequent tension and conflict.
- Humidity in the walls due to rain water and water puddles around the home that weaken the foundation and can generate a risk of home collapse.
- Rapid deterioration of the home due to the use of inadequate materials or errors during building.
- Excessive concentration of smoke and soot (defective stoves, no chimneys), which affect people's sight and lungs and cause acute respiratory infections

or chronic illnesses and lumbar pain, particularly in women, due to the position assumed during cooking.

- Trash accumulates in the homes and the streets, which attracts rodents and insects and increases the risk of illnesses in humans.
- ## 3. OBJECTIVE OF THE MEASURE
- Improve functional conditions, sanitation and physical security (against the cold, wind, frost and rains) of homes, protecting the families and children in particular from factors that may affect their health and well being.
  - Strengthen habits relative to order and hygiene in homes.
  - Improve the harmony and self-esteem of families and children.

## 4. SET OF PRACTICES THAT THIS ENTAILS

Practices to improve families' health:

- Improve stove.
  - Maintenance of water taps to ensure that the water consumed is free of dirt and protected against insects and bacteria.
  - Order and cleanliness of the home.
  - Food storage.
  - Installation of latrines and dry toilet.
- Practices for physical security in rural homes:
- Protect the bases of external walls with rocks to prevent risks of damage caused by humidity as well as foundation collapse.
  - Improve roofs and eaves to protect the home from rain damage.
  - Set up drains in areas around the home to prevent water from poo-



ling and weakening the home's structure.

- Plastering and painting walls to prevent erosion caused by rains, insect nests and dust accumulation.
- Practices to improve emotional health (family harmony):
- Organize rooms to receive visitors and separate the bedrooms of children and parents.

## 5. BENEFITS CONFIRMED BY THE FAMILIES

- Home improvements boost families' pride and dignity.
- Helps improve family relations.
- Local materials can be used to build and improve homes.
- Efforts involve all members of the family, who decide on the size and location of rooms

based on their needs and vision of spatial order.

- Promotes organization and teamwork.
- Improves the families' health conditions.

## 6. AVERAGE COST

Total average investment in the experience in Huacrahuacho: S/. 4,406 nuevos soles. Manual labor S/. 1,280, Materials S/.3,126.

## 7. MAIN REQUIREMENTS

- The families must have a space to build a home or a proper home to improve, as well as the need and willingness to improve their home.
- People must receive training for home improvement, hygiene, health, safety and maintaining and conserving the new space.
- Improving a home

requires investment in purchasing some inputs that cannot be found in the area; therefore, families need to set aside economic resources and dedicate time to the construction process.

- Requires technical assistance.

## 8. COMBINATIONS / INTERACTION WITH OTHER MEASURES

- Early Childhood Development: more comfort, hygiene and physical security in the home facilitates early stimulation, breast feeding, etc.
- Green house: when this structure is located adjacent to the home, it captures heat to improve the internal temperature of the rooms, which reduces the cold and limits filtration of humidity.
- Family vegetable gardens: the houses' peri-

meter fences also protect the vegetable gardens.

## 9. PERTINENCE OF THE MEASURE WITH REGARD TO CLIMATE CHANGE ADAPTATION

If extreme climatic events intensify, they could put homes in rural areas at risk; this means that physical safety conditions must be improved to ensure that the home's location, design and structure adequately protect families from these events. Additionally, by improving conditions of thermal isolation in homes, families are better equipped to face rigorous climate conditions. Improving sanitation conditions in homes prevents health risks.

## 10. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio

climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba. ■

# Farmer's competition

*A methodology for rural training, adjusted to foster climate change adaptation in rural ambits*

## 1. DESCRIPTION OF THE PRACTICE

Farmer's competitions: "Apu Ritt'i Raymi" Yakuykiwan Kawsanchis (in Mollebamba, Apurímac) and "Apu Ritt'i Raymi" Unuykiwan Kawsanchis<sup>1</sup> (in Huacrahuacho, Cusco). Methodology to mobilize, train, and provide technical assistance to peasant farmers that facilitates processes to adopt and strengthen good practices that are compatible with adaptation to climate change at the family and communal levels; encouraging healthy competition between participants and stimulating those who achieve improvements and/or significant advances.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

Lack of training and technical assistance services for peasant farmers that strengthen adaptive response to the climate changes they undergo, which puts at risk their livelihoods.

## 3. OBJECTIVES OF THE ACTIVITY

Provide training and technical assistance to peasant families and communities to implement good practices for natural resource management, agricultural and livestock production, and the family habitat that explicitly and deliberately include technical and organizational criteria that reduces the

negative impact of local climate change and the vulnerability that is directly associated with the same. This entails applying a peer-based training methodology (peasant farmer to peasant farmer), based on own experience and practice (learning by observing and doing). The ultimate objective is to generate tangible improvements in the family farm and the community.

## 4. DISTINCTIVE FEATURES OF THE COMPETITIONS

- The competitions were the means through the implementation of adaptive measures in the Huacrahuacho and Mollebamba watersheds was promoted; an alternative development approach was used based

- on the Pachamama Raymi peasant farmer training model, characterized by motivation, innovation, peer-based technical assistance and competition.
- The competitions articulated a set of issues and actions that each peasant family could implement on their family lot.
- Horizontal inter-learning "peasant to peasant" fostered by kamayoqs, who are local peasant experts.
- The approach of "learning from the best" facilitated an exchange of knowledge and abilities through apprenticeships, practical courses and visits.
- Motivation as a stimulus of healthy competition, which recognized families that displayed the most progress or innovative applications.
- The local selection of



- a peasant farmer jury to evaluate and measure the families' progress and innovation.
- The involvement and leadership of local actors, such as the district municipalities, which participated in the organization and development of the competitions.
- Promotion of alliances with development institutions, including AGRORURAL, which provided complementary support for the competitions.

## 5. NUMBER OF COMPETITIONS HELD

4 cycles of competitions were held at the family and communal levels (2010 - 2012):

- 3 cycles were facilitated by the Asociación Pachamama Raymi<sup>2</sup> with

- which PACC had signed a mutual cooperation agreement (June 2010 to December 2011).
- 1 cycle was facilitated by the municipalities of the two watersheds, with the support of the PACC technical team (2012).

## 6. STAGES AND ACTIVITIES

The stages and activities of the peasant farmer competition were:

1. Definition of the conditions, specific actions and the competition's scoring system.
2. Signing up families, after information was disseminated at community assemblies, radio programs and household visits.
3. Training peasant farmer juries.

4. Technical assistance and training for families through courses and periodic visits.
5. Peasant farmer juries score the work of participating families.
6. Award ceremony for the winning families.

## 7. ISSUES ADDRESSED

- Water (sowing and harvesting water).
- Vegetation cover (pasture management and forestation)
- Soil (using organic fertilizers)
- Food security (vegetable gardens, crops, raising small animals, health, early stimulation and monitoring the development of boys and girls under the age of 5).
- Housing (organizing, improvements, expansion).

## 8. REFERENCES

PACC 2014, Explorando respuestas adaptativas a la variabilidad y cambio climático con familias y comunidades altoandinas de Cusco y Apurímac. Caso de las microcuencas Huacrahuacho y Mollebamba. ■

<sup>1</sup> In both cases, the transcription is: "Festival of the holy snow-capped mountain," "Thanks to your water we can live."

<sup>2</sup> Non-profit organization that was formed in 2008; engages in activities to promote rural development through the Pachamama Raymi methodology.

# Training program on climate change for men and women community leaders

## 1. NAME OF THE PRACTICE

Training program on climate change for men and women community leaders

## 2. OBJECTIVES OF THE ACTIVITY

Strengthening capacities and community leadership to boost the community organization and development planning under climate change conditions, promoting sustainable management of natural resources, food security and reducing risks in

their communities, in interaction with local institutions

## 3. DISTINCTIVE FEATURES OF THE PROGRAM

- The program was designed and implemented by the Center to Promote Inter-Cultural Knowledge (CEPROSI) in 2011 and 2012.
- The program was part of the framework for dialogue and inter-cultural relations, which recognizes the complementary nature of knowledge, strengthens self-esteem

and values the cultural roots of participating peasant farmers.

- The methodology used was experience-based and communicative; it promoted an exchange of experiences based on Andean knowledge and learning from academic/scientific knowledge.
- The program combined constructivist, environmental and cultural perspectives to strengthen skill, abilities, attitudes, behavior and knowledge. It also contemplated love and respect for Mother Earth.

## 4. PROGRAM CYCLES

- The training program for men and women community leaders on climate change was implemented in 2 cycles (2001 and 2012).
- 102 community leaders from the watersheds of Huacrahuacho, Cusco and Mollebamba, Apurímac participated (57 in 2001 and 45 in 2012).

## 5. WHAT TOPICS WERE ADDRESSED?

The program consisted of 5 modules:

- Module 1 – Climate change.



- Module 2 – Water management.
- Module 3 – Food security.
- Module 4 – Managing Disaster Risk.
- Module 5 – Community Organization and Management.

## 6. DEVELOPED THEMES

The steps to develop the program and inter-cultural processes were:

1. Opening the minds and the hearts of the leaders through spiritual experiences to develop awareness.

2. Identification of cosmovisions, perspectives of living side-by-side with nature and the type of “development” to propose.
3. Share information on the issues in the modules and local requirements.
4. Exploration of local and external potential to adapt and a dialogue to share knowledge.
5. Evaluation and recognition of scientific knowledge as enriching to the

6. Presenting the modules’ contents with visual materials, participative dynamics, visits and experience sharing to understand the effects and impacts of climate change at the local level.
7. Man and women leaders present their reflections and analysis.
8. Commitments and agreements regarding actions to take to adapt; to be implemented locally.

## 7. THE ROLES THAT WERE TAKEN ON BY TRAINED LEADERS

- As Kamayoqs and facilitators in farmer competitions organized by Municipalities and PACC to promote adaptive measures.
- As leaders in their communities.
- Employed as technical staff of local Municipalities and of Special Projects of the regional government of Cusco, like in the case of the Institute of Water and Environmental Management - IMA.

## 8. REFERENCES

Reports from the Program to Train Community Leaders in the Watersheds of Huacrahuacho and Mollebamba. Published by CEPROSI, 2011 and 2012. ■

# Competition between education institutions

*The school encouraging attitudes needed for new times of change*

## 1. DESCRIPTION OF THE PRACTICE

Organization and implementation of Competitions between Education Institutions "Pachamamapi Sumaq Kawsay" in the district of Juan Espinoza Medrano, Mollebamba watershed, Apurimac; to strengthen awareness and involve the education community in environmental protection and the promotion of adaptive

actions at the family and community level.

## 2. PROBLEMATIC THAT THIS PRACTICE SEEKS TO ADDRESS

Weak involvement of schools in environmental issues and the limited interaction between school-community

## 3. OBJECTIVES OF THE PRACTICE

Promote the inclusion of educational content

about climate change and risk management in the Institutional Educational Plans-PEI and develop school level practices to address these issues in the Education Institutions of the district of Juan Espinoza Medrano, province of Antabamba, Apurimac region.

## 4. HOW TO IMPLEMENT THE MEASURE

• The competitions' con-

ditions were agreed upon with the Local Education Management Unit-UGEL in Antabamba.

• The education centers in the watershed were invited and the conditions were disseminated among them.  
• Technical assistance and training was provided to teachers, aimed at including contents on climate change and risk reduction in the Institutional Educational Plans and to teach the same in the classroom.



• Teachers imparted knowledge and guided school level practices. Criteria marked were: the quality of the inclusion of contents in the PEI, the level of involvement of the teachers and students in the actions, the students' internalization of knowledge and the adoption of practices.  
• Two cycles of competition were held in 2011 -2012, which involved approximately 50 teachers and

400 students at the early years, primary and secondary school levels at 12 education institutions (one of which was Educational Institute of Vito).

## 5. BENEFITS AND CO-BENEFITS

• Development of attitudes among students that are conducive to environmental protection and adaptation to climate change.  
• Improved school environments by taking into con-

sideration environmental aspects, safety and adaptation to climate change.

• Involvement of the schools in the climate change problematic that affects the community.  
• Developed the influence that boys and girls can have on their parents with regard to implementing measures to adapt the family farm plot.

## 6. REFERENCES

PACC 2014, Summary of

the Competition between Education Institutions in the district of Juan Espinoza Medrano (not published). ■

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## *If the clouds*

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If you walk up the Laramani, that apu who watches over the lands south of Cusco, and if you stand next to the Milphu lake, the one Américo has known since childhood, you will have an infinite canvas of pastures in front. And maybe, even though far away, you can imagine the terraces that have shaped the Apurimac mountains for many centuries; and the minka of the community members of Mollebamba, who trust this year will not again bring the loss of the harvest of native potato in the laymes, because of an unexpected dry spell; and another minka, of the thirty-two of Vito, who clean the qocha of Imaya during the larqa pichay festival; and the recovered bog, downstream of the Quillihuara lake, where Eleuterio's horses graze. And you will notice rain clouds in the background, beyond Ricardina's plot, the community's visionary; and three Kjana Hanansaya mothers, breastfeeding just like they learned in the Baby Mamoncito Competition which was won by baby Julio Roger, who his mother named after a singer of Espinar. And you'll see the community members of Quillihuara in their assembly on the 10th of every three months. And at the very end, on the top of the Oqqesopa mountain, you will find Silverio, the man who looks at the sky, looking at the sky. And you will look at the sky, and you will think that if the wind comes from the west, and if the clouds are blackish, rain will come.





◇ 2 ◇



◇ 3 ◇



◇ 4 ◇



◇ 5 ◇



◇ 6 ◇



◇ 7 ◇



◇ 8 ◇



◇ 9 ◇

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## *Caption*

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1. *Oquebamba, Cusco.*
2. *Mollebamba's watershed, Apurímac.*
3. *Mollebamba, Apurímac.*
4. *Qocha Imayá, Vito, Apurímac.*
5. *Quillihuara, Cusco.*
6. *Kjana Hanansaya, Cusco.*
7. *Vito, Apurímac.*
8. *Kjana Hanansaya, Cusco.*
9. *Mollebamba y Silco, Apurímac*
10. *Pumathalla.*



[ Lenkiza Angulo, national coordinator of the Climate Change Adaptation Program-PACC Peru]

# "ADAPTATION REQUIRES ORGANIZED ACTION BETWEEN SOCIETY AND THE STATE"

**A**fter five years of this program, do you believe that it is possible to adapt to climate change?

I believe that it is possible to manage the risks associated with climate change, which we are already experiencing, and the changes that may occur in the next twenty years in light of the scenarios at hand. It is possible for us to adapt to these conditions in a transforming way. And why do I say transforming? Because it shouldn't only be about reducing the risks that climate change implies. It should also be seen as an opportunity to improve the population's living conditions, rethink our development, and add quality to it. Beyond this time horizon, it is difficult to give an answer. Also, we mustn't forget: all adaptation has limits.

Climate change is currently the largest challenge that humanity faces. It will depend on how it is managed globally: if nothing is done, or little is done to reduce greenhouse gasses, the changes may be dramatic.

**In your experience, which should be the key elements of this adaptation?**

First: it is necessary to have a knowledge base—which can come both from science and local knowledge—to identify the effects of climate change and the problems that it produces and intensifies at the local level. Second: the capacity to generate political and social agreements to take actions directed at reducing the impacts of climate change and the associated vulnerabilities. Third: the means to adapt, access to technology, abilities and resources. And fourth: have the capacity to evaluate the actions that we take, to determine if we have really moderated impacts or reduced vulnerabilities.

Doing all this is not easy: it requires social organization to back these actions; we need institutions with capacities to respond to the technical and social demands that are generated by climate change. Adaptation is not achieved with isolated actions, nor with projects alone; it requires organized and collective action between society and the State.



The measures associated with sowing and harvesting water and the recovery of high Andean pastures have been the most successful because they address a neuralgic problem: the increasing disappearance of water sources for productive and domestic use.

**PACC was implemented in Cusco and Apurimac. Could the program work in other departments or even in other Andean countries?**

It is not PACC's purpose or mission to reproduce its efforts in other spaces in the country or beyond its borders. At the local level, we have concentrated on promoting experiences that provide answers with regard to what to do and how to deal with climate change in the rural highlands. We have tested methodologies and technologies and have generated learning that has involved peasant farmer families, communities and local institutions. And we want to share these experiences to inspire others to expand these actions. The groups that we hope become involved are political decision makers, who can generate the conditions needed to expand actions.

**Of all the measures that have taken place, which would you say has been the most successful?**

All the actions associated with sowing and harvesting water, and those with managing and recovering natural grasslands in the Andean highlands. And why? Because these allow us to address a neuralgic problem: the progressive disappearance of water sources for productive and household use. In the case of natural pastures, this approach also improves food availability for animals. These measures have been quickly embraced by families and communities. The benefits are evident in the short term: in improvements in water regulation, which has helped recover springs, wellheads, *puquiales*; and biodiversity in pastures, as well as other vegetation species and birds. These actions also improve the micro climate—because the small reservoirs that have been created moderate the surrounding climate—and also enhance the landscape, while generating socio-cultural benefits, because they strengthen community action and the local culture by revaluing and integrating ancestral technology.

**How many families have benefitted from this program over the past five years?**

1.758 peasant farmer families, from two watersheds, have been given training and technical assistance.

**What do you believe the community members have learned about climate change that they didn't know before?**

They now know that the climate changes that they observe in their communities are part of a global phenomenon. And that their local knowledge is valuable in efforts to address these changes and must be strengthened.

**And what have you learned from the community members about adaptation?**

We have learned that many of the responses we sought, have been explored by the inhabitants of the Andean highlands since a long time, as part of their efforts to manage the climate variability that is naturally present in the Andes. And these responses are also appropriate for dealing with the climate change conditions that are expected in these areas. But we have also learned that many good practices in rural development can become adaptation measures if they are specifically directed at preventing or reducing the impacts of climate change.

**What weight does ancestral knowledge have in this relation with the environment?**

Ancestral knowledge still guides the relation of inhabitants of the Andes and their natural environment. This knowledge also incorporates and combines new knowledge because it is linked with their daily experiences. These are assets that should be strengthened in their use, along with access to new knowledge and appropriate technologies, which when well combined with Andean knowledge, will put these people in a better position to address the challenges that climate change will imply.

**Why is it important to bring this program to the political sphere?**

It is very important. Because the impacts and risks that climate change is producing in the rural Andean ambit requires massive responses. And these responses can only be facilitated through public policies that promote and provide wide and systematic support to adaptation. These expe-

PACCPeru



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riences, and others that are underway in our Andes, provide guidelines on the type of actions required, effective and low cost actions which mobilize the capacities of families and communities, and which become more urgent and pressing. But support is needed to take these actions.

**The first phase of this program has consisted of implementing a package of measures. And the second?**

In the second phase, we seek to contribute to expanding actions that strengthen the resilience and adaptive capacity of the peasant farmer families in the Andean highlands and which generate tangible benefits, through decisions and public actions that can be undertaken by different government actors. To accomplish this, we will provide information, evidence and technical support. Along these lines, we support MINAM in the process to identify, document and validate good practices for facing climate change in rural ambits throughout the country, that have potential for upscaling. We continue to work with the regional governments of Cus-

co and Apurimac and have signed a cooperation agreement with FONCODES through the Haku *Wiñay* project. With MINAM, we are also exploring the mechanisms that might enable this scaling up.

We insist that the challenge is to address this issue from a perspective of transformation, given that in contexts of rural poverty and social exclusion, which characterize the territories and populations of the Andean highlands in our country, adaptation to climate change must be linked to efforts to combat poverty and achieve sustainable and inclusive rural development. And it is from this perspective that public decisions should support adaptation to climate change. ■

***Yachaykusun***  
*Lessons on climate change from the Andes*

Ministry of the Environment  
Swiss Agency for Development and Cooperation (SDC)  
Climate Change Adaptation Program – PACCPeru

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**This publication was possible thanks to the contributions of the following local authorities and leaders:**

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Eudes Guerrero Mallma. Mayor of the District Municipality of Juan Espinoza Medrano, Antabamba  
Wilfredo Mancilla, Renzo Delgado, Belinda Mansilla and Tula Sanchez (Community of Mollebamba)  
Agustín Lupa y Amílcar Aroni and Cirilo Cahuana (Community of Santa Rosa)  
Nemesio Anamaría; Pio Mendoza; Demetrio Llacta; Antonio Anamaría. (Community of Vito)  
Teachers Carlos Sanchez, Fidelia Sánchez and Alcira Zela; and students Apuri Sanchez; Leydy Llaccta; Silvano Yucra; John Meneses and Bruno Llaccta. (Education Institution Vito)

**In the Huacrahuacho watershed – Cuzco:**

Evelyn Tuero. Coordinator of the Food Security Project in Kunturkanki  
Marcelina Huilleca and Bernabe Huarca (Community of Hanansaya Ccollana)  
Samuel Huarca and Guillermo Taparaco (Community of Pucacancha)  
Silverio Choquenaira, Rene Pontecil, Jenifer Quispe and Elio Ayala (Community of Pumathalla)  
Eleuterio Huaycho (President), Rolando Huacarpuma, Eleuterio Huaycho, Brígida Consone and Roger Huaycho (Community of Quillihuara)  
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Ricardina Mamani, Yolanda Labra, Victoria Mamani, Ana Gualberta Mamani (Community of Kjana Hanansaya)  
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First edition: December 2014

Run: 500 copies

Legal deposit in the National Library of Peru N° 2014-18019





The Climate Change Adaptation Program -PACC Perú was created to address the problem of climate change in the Andes. Its objective is to increase the capacity of vulnerable rural populations in the Andean highlands of Apurimac and Cusco to adapt to the main challenges of climate change and to reduce the impacts on their livelihoods, through the effective action of public and private actors.

PACC is a bilateral cooperation initiative between the Ministry of the Environment- MINAM and the Swiss Agency for Development and Cooperation - SDC. Its strategic partners are the regional governments of Apurimac and Cusco; the universities San Antonio Abad in Cusco and Micaela Bastidas in Abancay; and FONCODES. PACC is facilitated by a consortium consisting of HELVETAS Swiss Intercooperation, Libélula and PREDES; and receives advisory services from a consortium of Swiss scientific entities, led by the University of Zurich.

One of the main lines of action of the first phase (February 2009 - April 2013) entailed promoting rural adaptive practices at the family and community level. The pilot focused on two watersheds in Cusco and Apurimac, where 1758 peasant families of 21 communities were active participants. The program's second phase (May 2013 - December 2016) seeks, among other actions, to contribute to expanding the practices that boost the resilience and adaptive capacities of the peasant families in the Andean highlands.



Facilitator consortium PACCPerú:

