

"Shared Water for all": An Experience in Community-Based Watershed Management

Emilia Pool-Illsley, Catarina Illsley , María del Pilar Morales, Lucio Díaz Marielle, Javier Alarcón¹, Felipe Chana , Marco Antonio Flores, Albino Tlacotempa, Juana Flores².

Abstract

This paper analyzes an experience in community-based watershed management, which involves 17 peasant communities of the Mexican dry tropics of the State of Guerrero. In these communities, where peasants are the owners and custodians of the ecosystems where water is produced, local institutions, regulations and organization forms, as well as local knowledge and practices, determine the access, use, conservation and veneration of water. The project considers this is the base upon which to build a new model for intervention, at community and regional levels, by which to improve local control, integrate new technologies and create an atmosphere for stimulating collective learning and technological/knowledge appropriation to guarantee enough water in the region for the present and the future.

Into its sixth year, the experience has accumulated a large number of small water conservation projects implemented according to the plan each community has drawn out, through its Water Committee, in a participative land use planning and training process. A series of interviews with the members of these committees were carried out to assess their perception of the project, of the main results and impacts, problems and possibilities. This input is being used as the base for building both qualitative and quantitative indicators for measuring impacts from the local point of view. Also, to gain certain insight into the process of appropriation of the project by the communities and their institutions.

Key Words: *water, watershed management, local institutions, local regulations, participation, Mexico.*

¹ Group for Environmental Studies (Grupo de Estudios Ambientales AC, Allende 7, Santa Ursula Coapa, 04650, Coyoacán, México, DF macarena@laneta.apc.org)

² SSS Sanzekan Tinemi

INTRODUCTION

Over half of Mexican territory is legally recognized as social property: 29, 971 ejidos³ and comunidades⁴ own over 100 million hectares, which represent 51% of the national land coverage (INEGI, 1991), and include the greatest part of all temperate and tropical forests of the country, as well as the most important sheds for water supply (Boege, 2008). The legitimate owners of these resources are, for the most part, marginalized peasants, including the members of the 56 Indian groups who inhabit all Mexican ecosystems.

Although more general national Laws, like the Constitution and the General Law for Environmental Balance (Ley General de Equilibrio Ecológico, LGEEPA) consider the inclusion of communities and Indian people in decision making and public policies regarding their lands (article 2 in the Constitution; article 15 and others related to Natural protected Areas in LGEEPA), in the Law for National Waters (Ley de Aguas Nacionales, LAN) the ethnic issue is not considered, as neither are there any considerations for social, economic, cultural or gender differences, while reducing the concept of society to that of water users. It makes no mention of water "producers", the custodians of the areas and ecosystems where water is originally collected and stored.

The LAN and the National Water Commission (Comisión Nacional del Agua, Conagua) determine that the space for governance and participation shall be the River Basin Councils which correspond to the 13 hydrologic watersheds officially defined by Conagua in the country. In fact, these watersheds are very ample territories and the Councils become a boxing ring where a large range of actors concur as water users, to dispute over the control of a strategic resource, its uses and associated economic and political interests (Avila, 2007).

Representation of indigenous communities and water producers within the structure of these Councils is very difficult to attain. Representatives with voice and vote are defined according to different uses of water: agriculture, livestock raising,

³ Ejidos are a form of legal form of land tenure originating after the Mexican Revolution in the 1920's –1930's and recognized in the Mexican Constitution of 1917. They were portions of land owned by the State but given to a group of peasants with the usufruct right to it; this land could not be sold or rented. The *ejido* was to have land for each family in the form of agricultural plots as well as a common land for forest and pastures. Nowadays, as part of the neo-liberal policy measures of the Mexican State, these peasant farmer lands can be privately own by the peasant families as well as being sold to anyone who wants to buy them.

⁴ Indian community land is also a legal form of land tenure. It is the recognition of the ancient titles of property that the Spanish Colony recognized as original Indian settlements and territories. After the Revolution, the Mexican State recognized the right of indigenous peoples to their traditional original lands. It is collectively owned land by the members of those Indian communities and cannot be sold to outsiders; the community can give settlement rights to outsiders, however, without giving them formal land titles. But they must not be confused with concept of Indian reserves or Indian territories as in the USA, Canada or other Latin American countries.

fisheries, agroindustrial, services, domestic, public urban, industrial and ecological conservation. Government agencies like Conagua and State Government functionaries are fully represented. Other federal and state offices, municipal governments, academics and NGOs can participate with voice but do not vote. For this reason the option for Indian and peasant communities to participate and influence public policies and decision making on the use and distribution of water is very low to null. All this in spite of the fact that the supreme law, the Constitution, in its Article 2 mandates the recognition of territories and their rights (Avila, 2007).

On the other hand, there is little recognition, valuation and stimulation for sustainable management and conservation of the zones for water charge zones owned by marginalized peasants (or private owners for that case). Throughout time, most conservation has been sustained by initiative of the rural inhabitants, who have undertaken the costs.

In the past years some official programs have appeared in the environmental sector to attend and guarantee water production. Among them, in the Forestry Commission, the programs for Payment for Environmental Services, Environmental Compensation and Land-use planning and in the Commission for Protected Areas, the program for Community Forest Reserves. All these offer certain economic benefits for forest conservation in peasant communities, although only the program for Payment of Environmental Services is expressly targeted at conservation of water charge zones.

These programs represent a huge step forward in public policies by recognizing the role communities and peasants play in society, nature and its wellbeing. Yet, they are implemented according to the logic of the institutions in a top-down scheme of mostly isolated actions, and only rarely as part of processes that strengthen communities and their capacity to plan and control the use of their land and natural resources. The idea of commercializing surplus water prevails above the right of watershed inhabitants to provide enough water for their own needs. With very few exceptions, such as Procymaf in the State of Oaxaca, they do not promote processes for the creation of institutions for local participation and decision making.

Often, these programs ignore and/or overlap local institutions, creating conflicts and social dynamics that go against rational or democratic use and distribution of water, or they promote the construction of projects which are not appropriated by the community and thus do not receive any kind of maintenance and are soon abandoned or destroyed.

It is necessary to improve conventional schemes for rural development for more flexible, integral and sustainable models, built from the community up and that revolve around the logic of the local inhabitants, not that of the government bureaucracy. The first step in this direction is to leave behind the idea that communities and peasants are inept to plan their own development.

THE SHARED WATER FOR ALL PROJECT

Shared Water for All is one of several projects within the wider Program for Peasant Management of Natural Resources, which is implemented jointly between the Reforestation and Natural Resources department (*Área de Reforestación y Recursos Naturales*—ARRN) of the peasant association Sanzekan Tinemi (ST) Social Solidarity Association (*Sociedad de Solidaridad Social Sanzekan Tinemi*) and the Group for Environmental Studies, GEA, AC. This Program, initiated in 1995, does basic research, peasant management of territory and experiments conducted by peasants, primarily in relation to the use of common goods: palm, agave, soil and water, as well as land-use planning. The peasants from local communities who work with ST have contributed their knowledge regarding natural resource management, and GEA has contributed scientific and participative methodologies for working from a *watershed* perspective, at the community and regional levels. The work has been based on GEA's accumulated experience in facilitating projects since 1977, involving research-action efforts, local-regional participative diagnostic assessments and participative planning.

A fundamental starting point for working in the region—that is implicit in the concept of peasant management—is the recognition of the diversified strategies of reproduction developed by peasant families and communities. A set of subsystems is simultaneously managed, including: an agricultural plot, family garden, domestic animals, harvesting and hunting, hand-made crafts, the sale of products in local and regional markets, and the sale of labor locally and outside the region. Resources are not specialized, but rather administered in such a way as to carry out all of these activities in a coordinated manner, and thus insure the survival of these families and communities. Another principle is the recognition of the right of indigenous peoples and peasant communities to exercise control over their territories and natural resources, implying respect for their systems of self-regulation through their own norms and institutions.

The Shared Water for All project is an attempt to develop a replicable method for participative sustainable management of watersheds in marginalized regions of Mexico. Its premises are: increased local control over decision making and direct actions in land use will contribute to the recuperation of the quality of ecosystems in common and regional areas; effective mechanisms can be implemented for stimulating communities to first guarantee their own water supply and only then think of selling or exchanging surplus; if watershed management is understood as the need for regional programs that include conservation of the whole array of natural resources present as well as the implementation of certain productive projects for employment and economic benefit, rural marginalization could start to be reversed. If these include the reconstitution and strengthening of the spiritual ties of local inhabitants with Nature, peasants will recognize themselves and will be recognized with dignity as the guardians of the ecosystems that produce water for us all.

OBJECTIVES

The main objectives, formally stated, of the Shared Water for All project are:

1. To develop and implement a replicable method to promote community-based participative processes for integral watershed management and soil and water conservation.
2. To strengthen local technical and organizational capacities for sustainable local watershed management and control over decisions and actions taken

For the local actors, in the words of one interviewee, on the objectives: "There are many ideas about why to work with water, but the most important one is to improve. To improve the quality of water, to improve [conditions] for those who have less, because here there are people here who do not have access to water, and that is why we are working with water, together with many other people. So we do not dry out, so we continue to have enough to drink and to take, for the benefit of all. That is what we want with this work, to see the results we will have next year. Now is the time for anyone who believes and who sees that water is becoming scarce, to pitch in and lend a hand, for each one to do what he can." (Community Water Committee representative of the Jaguey).

THE REGION.

The region encompassing the municipalities of Chilapa, Zitlala, Ahuacutzingo and Mártir de Cuilapan is a traditional area where indigenous peoples have taken refuge, and is currently considered one of Mexico's 300 most marginalized regions. It is located in the Balsas River basin, in the center of the state of Guerrero, with altitudes between 700 and 2,500 meters above sea level, and vegetation consisting of oak and tropical deciduous forests. The population is of Nahuatl origin, lives in highly precarious conditions, with 35% of inhabitants without land, and 32.5% without remunerated employment. More than half of the inhabitants emigrate temporarily to other areas to work part of the year in order to complement their income. Of those who do have land, most have less than one hectare.

The region confronts serious social and environmental difficulties: decreasing size of labor force due to emigration; loss of traditional knowledge and technologies as older inhabitants die and young people are absent; and increasing loss of plant cover, soil and water as a result of intense pressure on resources (erosion, deforestation, steep slopes, extensive livestock production); plus poverty, public policies, community and inter-community conflicts, among other problems.

THE ACTORS

The Shared Water for All project involves a group of peasants, chosen as members of the Water Committee for their community by the General Assembly. Each Committee consists of three members (president, secretary and treasurer) who remain in that category from one to three years, as the Assembly decides. So far 17 communities and over 100 members have participated. In 2008 there are 36 active members. Each Committee in turn makes sure to involve the authorities, agrarian and/or municipal (three to six people from each community) and has the commitment to take part in all the training activities carried out by the program. Also to lead the planning process in their community, to administrate the funds, to

organize the construction of the projects (buy the materials and hire the workers, sometimes up to 80 people, always from the community) and to deliver accounts to the Assembly.

The Committees can be members of Sanzekan Tinemi or not; they can participate for one year and then decide if they wish to join the organization, and even then will not be limited if they do not join.

ST and GEA work to facilitate, promote and assist in the process, with their teams working together in a coordinated manner, combining their skills in civil-engineering, geology, architecture, agronomy, agro-ecology, anthropology, participative methodologies and communication. A group of local promoters has been trained and is actively responsible for much of the field work. There is also a group of respected peasant elders who act as local advisors for the project.

Funding comes primarily from the Mexican Gonzalo Rio Arronte Foundation, and is complemented by Ford Foundation and several government agencies, especially the National Forestry Commission (CONAFOR).

THE METHOD

The method centers on training to strengthen local capacities. For years, local inhabitants have formed self-organized groups of users of water springs, collectively covering the costs of hose and maintenance to bring water to the household of each member of the group. These same groups were invited to join the project, through their community general assemblies, in order to work together not only for the extraction of water but also to improve and maintain their water sources and the watersheds that sustain them. Through workshops and a permanent training and learning process, peasants from communities have actively become involved in the project. Each community names a Water Committee consisting of three people, to take direct part in the project.

Each Committee has identified and outlined its watershed on maps created from enlarged topographic charts and photoimages (a combination of digital orthophotos and Landsat images); they have also characterized their environmental and social problems. Based on their own experience, which stems from traditional knowledge and new information gained through workshops and visits to other experiences, each group formulates an annual work plan for its watershed.

Each plan is presented to the general assembly for discussion and approval. After that, plans are presented to an assessment committee, formed jointly by peasants and technicians, who visit each site proposed in the plan for a specific water conservation project, suggest adjustments and approve it.

The next step is to sign a contract between the project and the group. The project offers part of the funding needed to carry out the plans (small gabion and stone dams, protection of springs, reforestation, etc); the group is in charge of the logistics. When it is necessary to work with communities upstream, they are invited

to join through their authorities.

Throughout the year, the groups gather for visits and exchange of experiences, during which they analyze problems and possible solutions. At the end of the cycle, each group makes a formal delivery of its work to its general assembly.

RESULTS

During the first five years of this project plans have been carried out in 17 communities, resulting in:

- 1200 filtering stone dams,
- 356 terraces,
- 24 sets of contour ditches,
- 20 gavion sedimentation dams,
- 6 cement and stone dams for water storage for different uses,
- 1 wave breaker,
- 12 protected springs,
- 100 hectares reforested with native plants
- 18 hectares of soil restored in fields abandoned due to severe erosion, in process of transformation towards agroforestry systems,
- 49 Dry latrines, 12 firewood saving stoves and one non aerobic sewage digester.

Some environmental impacts:

- Increase in water tables of rivers and streams in La Esperanza, Oxtoyahualco, Trapiche Viejo and Santa Ana.
- Cleaner water for human domestic use, through protection of springs, and for livestock through small concrete dams: Santa Ana, Tlalcomulco, La Esperanza, Topiltepec, Oxtoyahualco, Agua Zarca.
- Possibility of emergency irrigation for small-scale agriculture and for fisheries through concrete dams: Oxtoyahualco, Trapiche Viejo y Xocoyoltzintla.
- Terraced slopes apt for agriculture Tlalcomulco, Oxtoyahualco, Ahuihuiyuco
- Rescue of species of flora in danger of local extinction: Las Joyas.
- Restoration of deteriorated soils : El Peral, Oxtoyahualco.
- Transition towards organic agriculture: Xocoyoltzintla, Ahuihuiyuco, Tlacomulco.
- Improved management of human feces, diminishment of contamination of rivers and water tables and of risk of infectious diseases.

Economic impacts:

- Local jobs have been created
- Economic alternatives from local resources like palm and mezcal agave have been indirectly supported.

Indirect impacts:

- Increase in the awareness of the inhabitants of the region, some 150,000 people on the importance of integral watershed management management as a way to

maintain or improve life conditions, through dissemination of the project (exhibits, booklets, radio programs, video).

DEVELOPMENT OF INDICATORS

While the results previously enlisted are important, we wanted to assess which of these are considered relevant to the local population and why, what their perception of the impacts is. Also if the method is allowing for the Water Committees to become integrated into the local institutions, and if so, how this is taking place, what the learning process is leaving for the strengthening of local capacities for land use planning and negotiating with outside institutions.

A series of interviews with the members of the Committees were carried out in order to assess their perception of the project, of the main results and impacts, problems and possibilities. This input is being used as the base for building both qualitative and quantitative indicators for measuring impacts from the local point of view. Also, to gain certain insight into the process of appropriation of the project by the communities and their institutions.

We have taken 5 criteria drawn from the actual field experience of PM program to analyze the answers and therefore the type of impacts found to be relevant by the peasants participating in the project. This as a way to assess the capacity of the project to achieve capacity building at local level. These criteria are:

- Local institutional strengthening by stimulating participation and decision making of the communities involved.
- Knowledge production, capacities and “know-how”, that are actually transmitted or generated within the activities of the project: technical, administrative, methods, organizational
- Direct impacts, type of resources that remain within the community: human capital, physical assets (water, small dams, terraces, fences etc.), money, knowledge
- Stimulation of other processes that involve production, transformation commercialization and/or employment.
- Incidence in its surrounding context: public opinion or public policies at different levels.

We will allow the Committees to talk for themselves:

LOCAL INSTITUTIONAL STRENGTHENING BY STIMULATING PARTICIPATION AND DECISION MAKING OF THE COMMUNITIES INVOLVED

"[Working with water] comes out in one in many ways. One becomes a dreamer of certain things. In my case it was: if one day I could do this, I would do it happily. Why? Because I have seen it in the media, I have traveled to other towns, cities, where water scarcity is very obvious. Almost any community you go to you will

hear similar stories: Before we had plenty of water, but now we are dry. Many people will tell you, even, that Mexico City used to be a lake, and now it is not. So, it is because I see water is finishing in other places and to begin to do something, for example, this. We must all work together. For example here, some twelve years ago, it was not so hot, and water begins to be scarce because of the increase in heat". (El Jaguey⁵).

Local institutions and land-use planning processes

One of the relevant aspects of the Project is to promote participative planning processes. Decisions on what projects to build are taken in the General Assembly of each community. "The projects we have built, have been decided within the Assembly, here in the community, that way we decide among all. The technicians from Sanzekan and GEA do come, but they do not decide for us. They say "where do you want to build?" and where we decide it gets done. We go to the very place where we think it should be built and we all look at it, if it is a good place or not. That way we all talk about it, and since we know where our water springs are, we can make those decisions among all in an assembly with a majority of *ejidatarios* " (Oxtoyahualco).

Ahuihuiyuco is an interesting experience as it has no formal Assembly, because land tenure there is all private, yet organization evolved in such a way that decisions were also collectively made, "[We organized] in meetings, with callings, when we are ready to begin to work on a project, on a terrace or a dam, the person in charge will call and the group unites. The ten, all of us who have made a commitment, must come. The rest of the community can come and some do, but not many... We first organized for organic fertilizers and now to reforest, to build dams and terraces. ". Members of the Water Committee of El Jaguey explain that with the Shared Water for All project, "we share the same idea, we impact into it and begin to make proposals. We drafted our work plan, this one we are now carrying out ".

In Assemblies new agreements are made. El Peral went through a very interesting process of decision making. The *ejidatarios* collectively decided to stop cutting down trees or selling firewood and instead decided to fence, plant agave, take care of the seeds and clear the land. El Peral has made headway partly because they were capable of reinstating old and forgotten practices. The forest "was destroyed, because firewood was taken out every day. When we started to plant new trees, we stopped felling, and now that has almost stopped completely. [Wood was cut] for fire or to sell. Now we do no longer sell firewood and we are allowing the trees to grow. [When we need firewood for our own use] we cut carefully, one branch at a time. We want to have forest again, because we had lost it, and our water was also leaving us. Lately, we have not suffered because of lack of water ".

Land tenure and local institutions

⁵ All interviews are to members of the Community Water Committees. We will mention the community in each case, reserving the name.

In Oxtoyahualco, the fields surrounding the spring were all private property, "but since it was the community that was really in charge of them, they were called and asked to turn the fields over, that was a collective benefit, it was better to fence them and plant trees instead of corn. It was also decided to stop cutting trees. The decisions were made by the General Assembly in the common house, with the agrarian authorities. These agreements were taken when we realized we were drinking water that was not clean, and we all believed we were losing our water because we were not taking proper care of our forest ".Common good prevailed over private property, and the Assembly regulated it.

In Ahuihuiyuco, where land is private, in spite of coming from a different logic, the members of the Committee have achieved a high level of organization, they have increased their following and have attained agreements with other members of the community. Ahuihuiyucodoes not have the institutions of an ejido, it faces different conditions and conflicts and manages them in a different way. Participation also is different, more individualized.

El Jaguey had an institution for regulating Access to irrigation water: the Committee of the Irrigation Unit, which "...has been functioning for over twenty years. It is responsible for distributing water. We said to ourselves [the new Committee], -instead of making peoplefight over water that is diminishing, lets look for programs to improve our community. We found Shared Water for All ".

In El Peral they found a way to re-functionalize a scheme for access to common pool resources. Existing institutions and regulations were not considered satisfactory, so the ejido model which has been functional in great part of the country for more tan fifty years, was used to draw on for new agreements, "the part that used to be common land was divided among all, and now each one takes care of his piece of land. Many decided not to log and now they have some trees. [We decided that] here, among us, to stop destroying. Before, each person could log wherever he wished, and now each one takes care. The agave plantations have improved. [Before] the *comisariado* did not care, he would come and harvest agave, he did not respect. Now we can plant because we know we are going to harvest ourselves, not the *comisariado*. Or maybe a tree on tour land, it will be respected now, no one will cut it ".

Inter -community arrangements

Agreements between communities have also been established. "Agreements have been made with other communities. People from Trapiche Viejo have come to work in this ejido. They talked to the agrarian authorities and to the owners of the field-plots, and asked to work their lands. They have a spring further down, and part of it belongs to us, including where the dam was built. Their spring too is set in a watershed that belongs in part to Acatyahualco or Mazapa. That is the agreement, when they want to work in another ejido (because they will benefit from it) they ask permission from the owner of the plot and they come for the entire day, and everything goes well. They do not just come in, they have permission, they have made an agreement with the owner of the plot. A year ago we worked there,

they did not want to work, so we went to work in their ejido and they agreed, they called the agrarian and municipal authorities. We were a small group and we worked, we fulfilled their goal (because it gave us jobs). [Trapiche Viejo takes] most of its water from here, as does Agua Zarca. Our community uses little of this water, they take it all " (Tlalcomulco).

Stimulating participation, and participation of women

Within the communities, the Project also motivates participation, including still very incipient participation of women in the committees, even though they participate actively in the construction of the projects. "There are people who go and see what we are doing, they ask, they see our results and become interested, they want to do it too. We ourselves only started to work with water one year ago" (Ahuihuiyuco). In order to build a biodigestor for a primary school bathroom the inhabitants of Xocoyolzintla "organized ourselves, they named me committee, and I went to Sanzekan to ask for support. We had a problem with the old bathroom which had filled up and there was no longer a place for the children to go. We needed a solution for the benefit of our children. Parents offered to do the work on a voluntary basis. We all worked, we were 156 people" (Xocoyolzintla).

"Here everyone works. When there is going to be a project, the community is called, and whoever wants to work shows up. Men and women, we all benefit, whether we come to work or not " (Oxtoyahualco).

The only woman currently member of a Water Committee says: "I have enjoyed participating, even though sometimes I cannot go , because I have small children. [Here, I get to] work also, with my *compañeras*, we are here, working, we also pitch in, carrying stones and sand. [From working in the Committee] I have learned to participate, I am no longer so scared to take part, because when you have never gone anywhere you are nervous but now I am not any more ".

Working with the authority and local institutions

Another important element for the proper functioning of the projects is acknowledging and working alongside local institutions and authorities, even though sometimes there are ways around. "Now the *comisariado* (agrarian authority), never refuses to sign our papers, but we had a previous one who did not want to, even though the work was for the whole town. We have new authorities now, so we are trying to see if we can get a few more projects in before the change. We still have not talked to the new comisario (municipal authority). If he agrees to go along we can continue working. If he signs, seals the petitions we can do more work of this kind. If the *comisario* doesnt agree, we will go to our *comisariado*" (the Peral). In Ahuihuiyuco, where there is no Assembly to make agreements and manage conflicts, they have found ways to negotiate. "It is just a matter of asking the owners of the fields. If they give permissions, we can work, and if not, then no. [For the retranques], we came to an agreement just among ourselves. We invited our *comisario*, now we are going to see which of our neighbors agree and we will try to include them ".

"[In Assembly we talk about] the projects, so everyone knows what is going to be done and where. We talk to the *comisario* and *comisariado* about our work. As the authority he has to see that everything that is done is agreed upon. We talk and if there is an agreement we work, because this is an ejido and with the neighbors, we also come to agreements before working. This is a big community, if someone does not want to work, someone else will, and more. [In the fields] until now we have not had problems. If there is only one owner, we write down the agreement either as an Assembly memoir or as an agreement between two parts. This is how we have been working. When we carry out a project, it would be hard if we offend a neighbor. But if no one is offended, on the contrary, there are benefits, even people who at first did not agree, in time will say they like it. The important issue is not to go over limits, to recognize both authorities and workers, not offend anyone, work together and legally "(El Jaguey).

Results stimulate participation

Favorable effects of the actions motivate participation from new actors and communities. "People were not sure this dam was going to work [the gavion dam in el Coyote], but now the rainy season is over, we see it held up, it filled with sand and we see the benefits ".

Local institutions and legitimacy of the projects

There have been serious problems in some communities, where different interests have clashed and as a result the community has dropped out of the Project. Yet, in general, it has been well received in most places. Out of seventeen, only three communities have dropped out; one of them came back after a couple of years).

Working as member of a Water Committee, even though regulated by the General Assembly, still does not give the person much prestige within the community traditional structure as it still doesn't count in the *cargo* system, it doesn't help to give the right to become an authority, whereas being in other Committees, like the school-parents or fiesta related ones do. A good indicator of appropriation would be its inclusion in this complex traditional hierarchy.

"When I am no longer part of the Committee, then I will benefit, I will ask for work from the new president. Because many times the person who is in the Committee could take advantage and benefit and that is not right, he must first see for his people and then for himself, that is the way to work. I give the word when there is work (over the loudspeaker) for anyone who wants to come "(Xocoyolzintla). " When there is work, we announce it, and anyone who wants to work comes, man or woman "(Oxtoyahualco).

The Committees have, by their own initiative, incorporated certain legitimating practices, for example, upon finishing a middle size or large Project, like a dam, there is a ceremony through which the Committee delivers it to the Assembly, who is then in charge of its maintenance. There are inspiring words said at the site, a ribbon is cut and fireworks are burned; a collective meal is prepared.

The Committees have also been gaining confidence from their communities by re-distributing whatever material or economic surplus they may have after finishing a project. "[We gave the telesecundaria school] some steel bars, what is left over. Also some beverages. We have taken some Money from our funds. We do it also so the others will in turn help the Committee, so we are not alone. Every penny that is surplus we hand over, for a music player for the kindergarden school, the fence around the *telesecundaria*. We do it to help people out, so they realize we do help, even if just a few people come to work (and they add their voluntary work to paid work) so we have small surplus. For example we pay 70 pesos per one days work, so we have a Little left over and that goes for community projects, that is why I say the benefit is for all. Even if we do not all work, the benefit is for all" (Tlalcomulco).

Transparency and accountability

Each Committee keeps a file in a portfolio for all the accounting. Early in the year all Committees are offered a basic accounting course where the structure of the portfolios is explained. There is an internal regulation for the Committees which says how the files must be kept and how every penny must be accounted for. "We cannot steal the money, it is all in the rules, in the portfolio, each community has its own and everything must be in order. If we ask for money we can prove how we spent it, we have a contract, signed by our authority which states how we are going to use the money " (Tlalcomulco).

Maintenance of the projects

Projects that have to do with water conservation and catchment need maintenance. The project does not pay for this."When our dam filled up we went to the municipal president and he agreed to send a bulldozer to clean it out" (Trapiche Viejo). "We got organized to clean out our dam in La Palmita (Oxtoyahualco). "Now we are going to fix the fence to let the trees and agaves grow a bit more. After a while we will take the fence away ".

Rituals as part of the institutionalality

The Committee in Tlalcomulco is proposing to revive their lost celebration for petition of rain in the first days of May. "We will see if we can organize to venerate our springs next year, and invite you all from GEA and Sanzekan to come and eat with us" (Tlalcomulco).

KNOWLEDGE PRODUCTION: CAPACITIES AND TECHNICAL, ADMINISTRATIVE, ORGANIZATIONAL "KNOW-HOW" TRANSMITTED OR GENERATED WITHIN THE ACTIVITIES OF THE PROJECT

Understanding watershed dynamics

In the Peral, Trapiche Viejo and Mazapa, we can find cases where the communities have worked according to a logic that comes from understanding the watersehd dynamics. In the Peral, some ten years ago, reforestation of the higher parts of the watershed was started in order to protect and recuperate a water

spring. "Now we have more, and the water has increased a little bit. We planted the trees not long ago, so it is slowly coming back ". More recently "we dug level ditches and planted agave on the edges. We set up a fence to protect the small agave plants from cattle. We wanted to fence in order to restore, but also to allow Earth to dress herself ". As part of the field-plot restoration project several plots that had been deforested for agriculture and later abandoned were worked on; that was on the slopes. After that, in the ravines "we built about 25 filtering stone dams, because we have another spring at the bottom of the small ravine. We have a spring we use for our cattle, [but in the dry season it dries up]. There we worked to protect our water source. There the soil was being washed away, it was getting deep, so we built terraces to hold the soil. Some terraces, down at the bottom have already filled up, the ones we built recently still haven't. Now we will have to see how well they stand up ".

After analyzing the different necessities and problems in the community, the recent changes in the state of the springs and the dreams people have for their future "we planned to reforest and protect our springs, soapy water filters for the common clothes washing installations and which is used for irrigation. A little further down we are planning a gavion dam, to hold water from the spring in Los Amates, and a tank for containing water. We want to continue planting trees, to hold the soil in place. To protect the area where the cattle goes to drink water and to plant it with trees that draw water and hold down soil. We believe that if we can build a couple gavion dams further down and another tank, a bigger one, to improve the irrigation system. And other terraces here [retranques] will hold the soil where we want to establish our own plant nursery ".

Understanding technical changes

Local ways of understanding changes have been expressed. These have developed from knowledge of their environment and their empiric experience, their work and observing their results. The relationship between forest and rain has been reiterated on several occasions. The same has happened with organic compost. "Through time we have recognized that chemical fertilizers are double edged arms, they feed you, but with time they destroy you, your water, your body, with so many chemicals ". (El Jaguey)

Use of new equipment and technology

Maps and satellite images have been very important for community land use planning. "The projects we have built have been decided here in the community. We talk amongst ourselves, and since we know our territory, where the water springs are, we can decide. The maps [satellite images) are set out in the *Comisaría* [communal house], and there we can all see all our land, as if we were really seeing the real place, it is the same. There we use the images and there, we have drawn our ejido, so we can all place ourselves and we can decide where we are going to build the new Project and everyone understands how it is going to be and how we are doing it. Then, these decisions are taken by the General Assembly with the majority of *ejidatarios* present"(Oxtoyahualco).

Local and new knowledge

Local knowledge allows for the adaptation of new technology and sometimes for its rejection. Also for the recuperation of old techniques that are again validated. In Ahuihuiyuco, they explain, "The *tecorral* [Stone terrace] more or less is placed on the furrow, by parts, according to the slope of the land, 8-10 meters long. We place the terrace along the furrow to stop the water from eroding the soil. It works well, some fill up with soil, erosion is stopped and we have more soil, the soil is thicker. Without the terraces, when the rains come everything goes, leaving only the bare rock. Here since very long ago, we have leveled our furrows, to stop as much water as we can. When we plough, we look for the right form, for the way to keep the water from cutting the furrow and taking all the soil. Some people will use plant residues to make barriers, to hold the soil ". This can be done from experience or using an A-instrument, "you can trace the furrow, leveling it as you go. Most people have good experience, they know their land and do not need to use the A-instrument "(Ahuihuiyuco).

Learning through experimentation

Each community is responsible for keeping track of its projects, its reasons for doing them and what is still to be done. In Ahuihuiyuco, "so far we have built three gacion dams and some 2500 meters of terraces. We are planting agave in the forest, field-plots have been fenced for planting the agave. We have also planted trees". In Tlalcomulco, besides protecting springs, common land has been reforested and a great number of terraces have been built. "Terraces are built for plots on slopes. Soil is retained. We also built the gacion dam there. It is held from both sides, so it is strong and can hold up to the heavy rains. Then we built this other one down here to hold the path in place. The soil was going and water was washing under, making the ravine deeper. It worked well, and stopped the path from being washed away". In some houses a filter for soapy water is being tried out. "... there are three filters, and in the last one, water comes out clear, not like it is when you are washing the clothes ".

In Xocoyolzintla, the ditch trenches "are experimental" In Oxtoyahualco it was decided to modify the plan for the stone and cement dam they built. "We made the dam at La Palmita higher, using the money we had saved from the other projects; we talked it over amongst ourselves and with the technicians. We figure if it is larger it will hold more water. This is the first dam we are building close to the village ".

Learning from each other

Contact with other communities and their experience has been relevant. The courses, visits, exchanges between peasants allow discussion, reflection and integral learning for all involved, as well as greater appropriation of the project and motivate and promote new ideas and initiatives. "We have been to other communities, where they have already done work. That is the way it has been thought, to learn from others so we can also do our work and improve what we are

doing" (Oxtoyahualco). "During the visit in Las Joyas I saw how they were working, I went to learn. I saw they built dams, and I saw they were having results with their water, and so we started to do the same here too" (Ahuihuiyuco).

"We are new in this. The benefits will come in one, two, three years, maybe five. We still have not seen much, but we have seen what may come, in the workshops and courses, we believe we will have good benefits, more water and soil, and we will be able to do conservation of other resources. This is a long term plan, something we can dream of "(El Jaguey). As for the filtering stone dams, "we do not know how they work, we had never seen them, but we went to an exchange and saw they built them in Trapiche Viejo and they worked, with time they recovered water they had lost. [Also], they are starting to work with organic fertilizers, that is, they are working to conserve their soils. We are starting our own first experiences in that too. We have gone to other places and seen these experiences, so we invite our mates to try these things out, and we do our best on our own fields "(El Jaguey).

Learning from failure

Tenexatlajco joined the Project two years ago. Natural conditions in this village represent a great challenge for the project. Some of the slopes here have advanced processes of land-slides. They were deforested over twenty years ago, ravines are deep and its history of repeated land- slides represent a risk situation for some of the homes and roads. Because of the geologic characteristics, building dams and other projects to contain water can increase the risk factor. At the same time, there is a growing shortage of the vital liquid. "In May we have very little water. Before it never dried up, now we suffer and animals suffer ". The demand then is to retain soil, stop land- slides and try to hold back more water.

In a trial-and-error process which begun in 2006, work started in Tenexatlajco with a great number of filtering stone dams and gavion dams. But an extraordinary rain in July 2007 "washed away the filtering dams...thirty of them; only two held up. They did not work for us here. Only the gavion dams have helped us, they are much stronger ".

The risks are visibly increasing and there is awareness from the media that one of the effects of global warming are more frequency in extraordinary rains. "There used to be a basket-ball court here, but it is slipping too. The ravine fills up with water and rubbish. Up here, all this may come down this year. It is as if it had been sliced. We see how the oaks and palms come down even when it is dry. That was already October, when we built the other dam on that side ".

In spite of the backlashes, the Water Committee of Tenexatlajco have a good image of the project and are willing to continue working. "As long as there is something we can do we will go on, we will give it all our energy. We see it is good work. We would like to leave something behind us ".

The possible solutions to Tenexatlajco are being discussed and not always agreed on. Even though there is more agreement on what needs to be done in the higher

part of the watershed. "We want to work on our fields, so they stop sliding... We built terraces and 180 meters of contour ditches, to protect the slope, so it fills with soil and we can plant. Now we want tress and agaves for these terraces, some fruit trees and bamboo, plants that send roots down to hold the soil. [The land] is going, another part on that side also came down, and on the other side".

The experience in Tenexalajco shows a case where a complex set of problems coincide. There has been dialogue, not always easy and not always arriving at agreements, between the project geologist, technicians and the Committee. Because of the difficult conditions there is no certainty any of the projects will work, but there is hope the risk will be reduced. Keeping communication and dialogue open seems to be the only option.

DIRECT IMPACTS AND RESOURCES THAT REMAIN WITHIN THE COMMUNITY: HUMAN CAPITAL, PHYSICAL ASSETS , KNOWLEDGE.

More and cleaner water, more and better soil

Different projects are designed to have impacts on different points of the watershed, on soil erosion or water spring conservation. "We work to have sufficient water and to retain our soil. We are going after two benefits: soil and water "(Ahuihuiyuco)."Before, a lot of soil washed away, the water took it, and as there are parts where the slope is very steep, a lot of soil went. We can see the gavion dams are helping stop the soil. [With the dams] we are protecting the springs. If there is a spring down below, we make the dam higher up, to retain the soil and *lama* and trap the humidity so it can filter down to the spring slowly, and that way we have water all the time "(Ahuihuiyuco).

In Oxtoyahualco, with the dam at La Palmita, "we are all benefiting. When there is water, we all benefit. That is why we wanted to make it this way, a little bigger. [In the village] we are better off now, because we have more water. Before, we were almost dry. Only a small amount of water was dammed in one place, but no more, because we had not done any of this work. For us this is good improvement, because we have water and it is clean. "

"Here we have been building small stone dams and reforestation. Where we made the dams, we still have water in the month of April; before it would be all dry by this time. Then, that means it is holding humidity. That benefits our cattle, that goes there to drink water "(Xocoyolzintla). the spring where the animals drink in El Peral "...Still dries up, but it lasts longer. We can see it is also retaining some sand that will be useful "

There is more water and it is cleaner. The inhabitants of Tlalcomulco take water from the spring of Xuxucutla, and their cattle from Tepozonalco. In Xuxucutla "you cannot notice the difference because there is a lot of water, but in Tepozonalco you can see how it has increased, because in rainy season the dam fills up, and more rain comes and the water stays. That water feeds the small spring, it does not just pass through as it used to ". The spring in Xuxucutla has been fenced. Four years ago it was very different "It was abandoned, cattle would get in, goats, pigs, even

chicken. The water was dirty, but still we would drink it. But later we decided to close it off, and now it is much better. [We planted trees after we fenced the area off] and that also is helping. The plants have taken hold now, before they had all dried up.. [There used to be little water] but now we have a lot of water and it is cleaner".

In the field-plots restoration with agave, reforestation and terrace building has given very good results. The Water Committee from El Jaguey explains: "the leveled terraces give us the benefit of soil conservation. We have built close to 1200 meters. This way if each terrace holds 5 meters of soil a 50 meter plot on a slope will be holding back 15 meters of soil. These are the results we expect to see in some 5 years ".

Restoration of deteriorated soil

In Ahuihuiyuco is where the most integral experience of field-plot integral restoration and improvement has taken place. "A land that was just pure rock, I started to build terraces and now it is not a really good piece of land, but I recuperated it, it is good again. With the terrace you can keep more humidity in the *milpa* after it rains. The thicker the soil, the more humidity it keeps. The furrows also help the water to stay and if you have planted agave or trees around the field, it is better still. [This, together] with the way we plough, [helped us when] the extraordinary rain came in July, we lost a piece, but not all, like happened to other people. It did not drag us away. The rain even helped the terraces, it tightened them ". They continue, "the terraces has been good benefit for us. The plots that have stone get cleared, and we can work them better, plowing with oxen becomes easier and the soil does not get lost. When the slope is strong, it really holds the soil in place: When agaves are planted, it helps too, because it helps hold back a lot of soil. That is why we are present here, for the benefits".

Protecting springs

In other places springs have been protected too. "The spring in los Amates, was protected with a forty linear meter fence. We also protected the spring in el Coyote, with mesh. Trees that bring water are planted in the protected area. And animals don't get in any more, it is cleaner, better quality" (El Jaguey).

Improved agriculture

Ahuihuiyuco started working before with organic fertilizers. "We have done well with the organic fertilizers too. These are some good ideas that we have learned about, and now we support them, we will not abandon them. We have been saving some money, now that chemical fertilizers got so expensive. If before we needed 20 sacks of chemical fertilizer in one hectare, now we only use six, we save a lot. One field-plot I have been improving for about five years, almost needs no chemical fertilizer any more, the corn comes out and grows well and big. We think we will no longer abandon this, because it is helping us. We begin with half a hectare, now we are going to apply one and a half hectares with organic fertilizer.

We are growing. We still do not produce enough to sell, we have not attempted that. We work for ourselves, improving our own plots ".

When adding up all their work in the plots the members of the Committee in Ahuihuiyuco come to conclusions: "the harvest has increased because we have more soil, it is better attended, it is no longer abandoned as before. Before, if one gave it organic fertilizer and then the storm came, it would take it all away, but now it doesn't. We have improved the plowing and the terraces and that shows in the harvest. We see we can harvest a bit more corn. Eight years ago, I planted about 12 hectares, and now I am planting 3 or 4 hectares and I get the same harvest. That is the change, less work for the same harvest. That means we are improving our land. Here our women no longer suffer from lack of beans or corn, there is food for us, for our animals. And when it is time to work, we go to work, but if we say time to rest, we rest, because we have food ".

Other benefits

And there are other benefits. "[the gacion dam we built over the barranca] has helped, as it has stopped it from getting deeper. It has also created a pass for us to cross, and with the sand that filled it, it is better yet. Now even a burro loaded with firewood can cross "(Tenexalajco)."The gacion dam in the spring El Coyote, helped protect a tank we have for storing water. For us that was an emergency, for it saved the tank, from being washed away. We can also use the sand and *lama* that collects there." (El Jaguey).

The benefit, in general terms, is for all. "Here we all benefit. Whether you come work or not, you get water. We do not go and say –you did not work, so you do not have a right. We all own at least one animal that needs to drink water and they all come here, it is for everyone "(Oxtoyahualco). Sometimes the beneficiaries are animals, cattle, others humans, different users, be they full communities, *colonias*, *barrios* or organized groups." Terraces benefit mostly one person, the owner of the plot. ".

STIMULATION OF OTHER PROCESSES THAT INVOLVE PRODUCTION, TRANSFORMATION COMMERCIALIZATION AND/OR EMPLOYMENT.

Also, the project " brings jobs. Here we have no other source of income. This is a big help, the work we are doing " (Tenexatlajco). "For us it is not only having more water, but also another benefit, because there is no work here. For the families this is important because they will be earning at least one day's wages. That is not a lot, but at least something to bring home...sometimes we can hire up to 80 people...there is some benefit for everyone ".

INCIDENCE IN ITS SURROUNDING CONTEXT: PUBLIC OPINION OR PUBLIC POLICIES AT DIFFERENT LEVELS.

Negotiating with government instances

When a community has drawn out its work plan it has better capacity to negotiate with government agencies that come to offer programs. In Oxtoyahualco, after having participated in the Project and seen the advantage of ecological dry latrines they talked a government agency into building one for each family. "Now we have a bathroom in each house. A company came to build them. We had seen them in other places and we had a proposal with Shared Water for All Project, but the government came and offered to do something and we asked for that".

In Xocoyolintla, for the biodigestor, negotiation also included government agencies. "We organized, I was named Committee and I went to Sanzekan to ask for support. A government program AGE, gave some money. Then we talked to the school parents committee for their support, also to the Municipal Treasurer".

CONCLUSIONS

We find this experience, as assessed by the Committees, the local actors and direct beneficiaries has above all had impact on the strengthening of local institutions. A series of adaptations have been made by the Committees themselves to gain legitimacy within their traditional structure and no relevant conflicts have been created by the methods developed by the project.

The know-how and capacities that are transmitted are also relevant. They are technical, administrative and organizational. Some pick up old knowledge and some introduce new ideas and techniques.

The human capital, human capital and especially the physical assets that stay in the communities are highly valued.

Stimulation of economic processes is only temporary, as building the projects brings sorely needed jobs to the communities, but in the long run, conservation of the material base can be most relevant for resilience.

Incidence on the surrounding context is barely incipient, but growing, as the communities become more self confident on their knowledge and capacity to plan the use of their land and natural resources.

We believe the main objective of developing a replicable method to promote participation has been attained, at least for this region and other Indian peasant communities in which local institutions are somewhat strong.

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