Consilience

FIELD NOTE

Safe Drinking Water in Kuna Yala:
Field Notes from Panama

Michael Halperin[1]

Abstract:

Starting in early 2003, Michael Halperin worked for two years as a Peace Corps volunteer in the indigenous Kuna island community of Ustupu, just off the Northeastern coast of Panama. His work focused on the issue of potable water and diarrheal disease. These field notes focus on the implementation of sustainable technologies and practices for clean water. Emphasized is the importance of local knowledge, partnerships, and indigenous leadership. This story chronicles a two-year process of considering, rejecting, and finally developing the most workable solution for safe water: solar water purification. Unlike boiling and chlorination, this method was acceptable to the Kuna because it does not conflict with cultural practices on the island. It is likely that this method of water purification can be sustained over time.

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Starting in early 2003, I worked for two years as a Peace Corps volunteer in the indigenous Kuna island community of Ustupu, just off the Northeastern coast of Panama. My work focused on the issue of potable water and diarrheal disease. My training prior to moving to Ustupu consisted of three months of linguistic, cultural, and technical classes.

My Peace Corps training group sitting atop a newly constructed composting latrine in the town of Villa Carmen, Panama

This training, however, was not site-specific, so there was much to be learned once I moved to the village. In February of 2003, I arrived in Ustupu, after a 45-minute flight by twin-propeller plane to the airstrip on the mainland, and then to the island by canoe. For the next two years, I called Ustupu home.

The island rises just a few feet above sea level. Almost 5,000 people live there without paved roads or electricity. Ustupu is one of 49 inhabited island and coastal communities in the 350-island archipelago of Panama called Kuna Yala. The Kuna gained their autonomy from Panama after a 1925 revolution. In the last century, the island - the size of three football fields - saw its population grow from one-hundred to nearly five-thousand. A maze of thatched-roof homes are narrowly separated by zigzagging pathways, and towering three stories above this labyrinth is a large blue concrete water tank, the most conspicuous feature of Ustupu's aqueduct system.

Main Street: Ustupu, Kuna Yala

I worked with Melvin, or more accurately, I worked for Melvin. As a salaried employee of the community, Melvin was in charge of maintaining the aqueduct system that feeds this towering blue water tank on the island from a mountain stream a few miles away. To get acquainted with the system, I nervously scaled the three-story ladder up the blue walls to the top of the tank. Melvin led the way. He explained how the entire system worked by gravity. Pointing up towards the hills on the mainland, he told me how the water enters the piping way up the hill in a stream, and then flows in the pipe down the slope of the hillside to where the water pours into a sand filtration tank. The water seeps from top to bottom in the tank, filters through the sand, and exits the tank in piping. This water then makes its way down through plantain and coconut groves to the coast, across the bay, onto the island, and up into the towering blue holding tank where Melvin and I were perched. From the holding tank, gravity again propels the water down to community spickets, distributing it in a web of half-inch plastic piping that covers the entire island. Melvin's description of the system sounded much like the aqueduct systems I had seen as a Peace Corps trainee, so I wondered why the community was having problems with diarrheal disease.

The next step was a visit to the headwaters**.** Melvin and I paddled his dugout canoe across the bay to see the water source and the sand filtration system. We climbed uphill for about an hour to the water source. A white plastic pipe was encased in a concrete dam with the open end pointing upriver. Mesh wiring covered the intake and prevented large debris from entering the pipe and clogging the system.

The water source for Ustupu's Aqueduct system

Melvin and I then followed the piping downhill from the headwaters to the sand filtration tank, where Melvin told me we would find the source of the problem. A well-designed sand filtration tank should be filled with an even layer of sand.

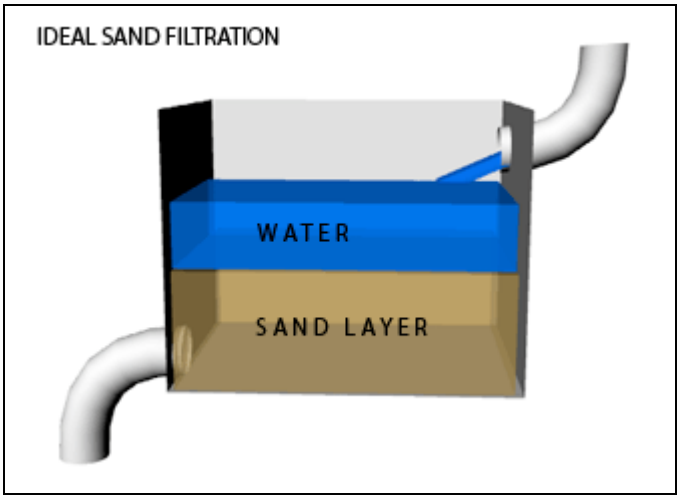


Figure 1: Ideal Sand Filtration Tank[2]

As we peered over the walls of the tank, however, I immediately understood Melvin's worry. The force of the incoming water had burrowed a tunnel through the sand, essentially eliminating all filtration.

[2] Thanks to Sam Halperin, my brother, for help with the two sand filtration computer renderings.

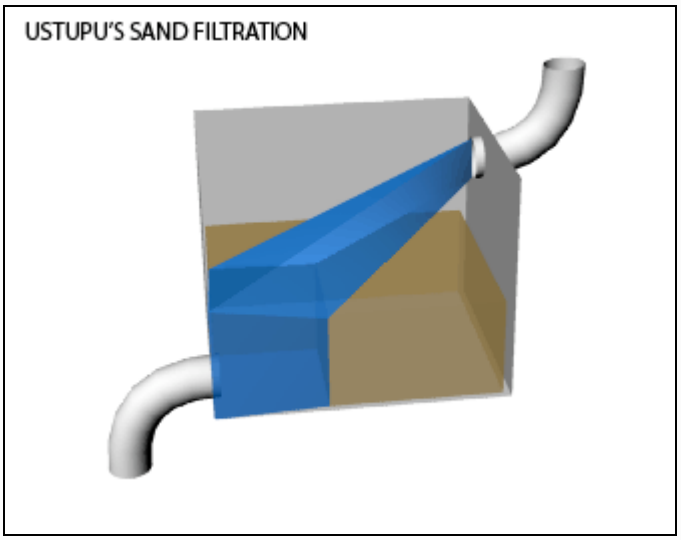


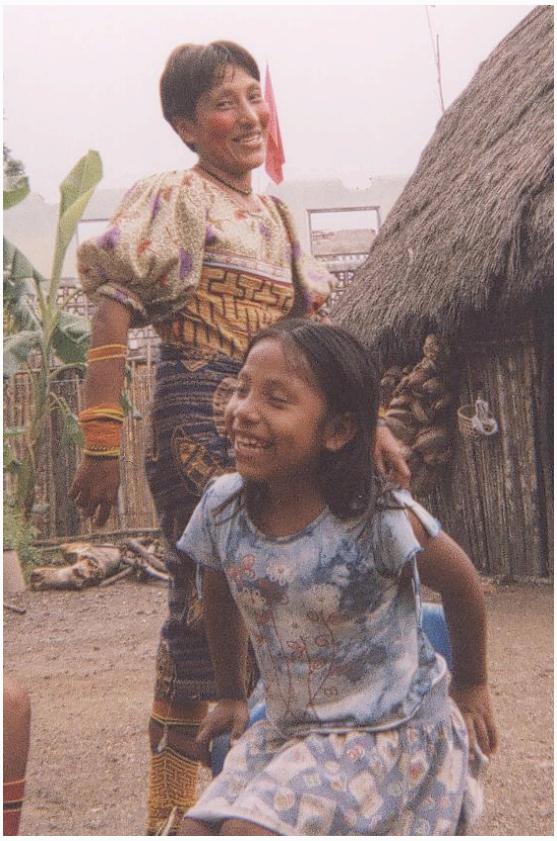
Figure 2: Ustupu's Sand Filtration Tank

Melvin was fully aware of the problem and explained that if he collapsed the tunnel created by the rushing water, it would take too long for the water to seep down through all the sand. The increased resistance of the sand filtration would create a bottleneck and the water would spill over the walls of the sand filtration tank and be lost. Melvin's explanation for the engineering failure seemed reasonable.

I felt that it took courage for Melvin to conclude that the city engineers from the capital who designed the system may have been at fault. The aqueduct dated back to the 1970s, and Melvin reasoned that it was probably built during the dry season, when the flow of the river was at its lowest. Once the rains came, the system, specifically the sand filtration tank next to where we were standing, was not large enough to handle the flow of water. During these early days on Ustupu, I offered Melvin moral support, but did not contribute much technologically. Over months and years I later learned from Melvin that I was indeed serving a function. Having me as a coworker, *un licenciado* (a college graduate), made it easier for Melvin to critique the system and voice his concerns with community leaders, who might otherwise have given the benefit of the doubt to the city engineers. On this first of many trips to view the inadequate sand filtration tank, Melvin reasoned aloud to me that unfiltered water was better than none at all. So the system was left in place, delivering what was surely contaminated water to Ustupu.

Melvin and I agreed that a larger sand filtration tank was needed, and worked with community religious and political leaders, and the *Sailah* (chief), to create a plan. The initial goal was to build a bigger sand filtration tank, one that would not overflow given the flow rate and quantity of water entering the system. We then approached engineers from both the Peace Corps and the Panamanian Health Ministry, and found that the cost was estimated to be nearly $300,000. A cost that was financially impossible. We needed a more realistic solution.

An official from the Panamanian Ministry of Health proposed a solution: chlorinating the water once it reached the blue holding tank on the island. If added one drop for every liter (four drops a gallon), chlorination would be a very effective purification method. Practically, however, the Kuna woman's groups were fervently opposed to chlorination because they considered chlorine a powerful bleaching agent capable of making the kids clothes sparkling white.



Ida, an important member of a woman's group on Ustupu

Melvin and the aqueduct committee were hesitant too because of the practice of using chlorine to dislodge octopuses from surrounding reefs. Harvesting octopus is dramatically easier if a small amount of the chemical is added to the sea-water surrounding an octopus. On Ustupu, men are commonly seen with a spear full of octopus in one hand, and a little bottle of chlorine in the other. As a result of these cultural practices, the idea of drinking anything with chlorine in it was met with great opposition.

The next alternative focused on water purification at the household rather than at the municipal level. Most Kuna were well aware of boiling but rarely adopted it. While boiling would purify the water, there was no reasonable economical source of fuel. The Kuna live on the island but travel daily to the mainland to farm. Bringing firewood to the island meant bringing home less food.

Harvesting plantain from the mainland

No rational woman would trade food for safe water. We were left with no practical solution for decontaminating the water.

Months later Melvin and I learned of the possibility of solar water purification. We first heard of this technique at a sustainable technologies seminar in another region of Panama. The dissemination of crucial information is very slow on Ustupu because there is neither access to a library, Internet, or experts. The limited flow of information to Ustupu was in many ways as problematic as the flow of water. Peace Corps volunteers can be useful information brokers by bridging information gaps and communicating new technologies, even very rudimentary ones.

Solar purification is a really simple process; a transparent two-liter soda bottle is filled with water, the top is closed, and the bottle is placed in the sun for 6 hours. The heat and UV radiation kill the contaminating organisms and make the water safe to drink.

Regardless of Melvin's stature in the community and my supporting role, there was an intellectual resistance to the idea that the existing system needed fixing. People were often perplexed by the idea that the current system, built for them by government engineers from Panama City, could make them sick. Although I could not see the biological organisms in the water, I knew they existed. I came to realize that my knowledge of these organisms was not intuitive, but really dated back to when I was a child experimenting with a microscope in science class. I recalled from biology classes in high school the story of Leeuwenhoek's surprise in the 17th century when he first looked at water with a microscope. During our Peace Corps training, we were taught about techniques used to purify contaminated water and the sources of biological contamination; but, it was assumed by our instructors that we would not question the fact that the organisms were there in the first place.

Explaining solar water purification to a group of water technicians at a seminar in the neighboring community of Ucupseni, Kuna Yala

As I went from house to house excitedly talking about this new solar technique, I noticed a familiar look on the faces of the Kuna. For people in the village, the existence of the organisms was not intuitive, just like it had not been for me until I saw them under the microscope. Without a microscope to be found on the island, few people had ever seen anything on the microscopic level. I knew that many people believed there were harmful organisms even in water that appeared clear, but without having seen them for themselves, there was a definite lack of enthusiasm for solar disinfection.

On my next trip out of Ustupu, I was able to get an old microscope and returned with it to the village. The response was unbelievable! One look at a sample of river water, especially after a heavy rain, and the villagers now had a visual image when Melvin and I spoke of microscopic organisms and "dirty" water. The glass of water that I would hold up had the same clear, clean looking appearance as before, but after looking through the microscope there was increased validity and understanding that the "dirtiness" existed beyond what the eye could see. Mothers took ownership of the project, making sure that they had sufficient supplies of plastic bottles laid out on their thatch-roofs for everyone in the family.

Unlike boiling and chlorination, the solar water purification method was acceptable to the Kuna community because it did not conflict with cultural practices on the island. Men were not being asked to expend time and energy to bring back additional wood for fuel to boil water, and women did not need to set aside their objections to chlorination, both obstacles to the sustainability of these techniques. All three methods are technically feasible, but only solar purification was culturally acceptable.

While I was helping on the plantain field, Melvin once commented on why he thought the solar purification method was viewed positively. The Kuna, well acquainted with the powerful tropical sun, seek shade during midday

hours, when the suns rays are most powerful. Therefore, especially with the visual provided by the microscope, it made sense that the sun could kill the microorganisms in the water. Making solar purification increasingly workable for the Kuna was the fact that plastic bottles, the only equipment needed, were cheap and available from passing merchant ships.

Passing merchant ship

In a subsistence agricultural community like Ustupu, where the monetary unit is often still the coconut (worth 5 cents each), solar purification demonstrates that appropriate health interventions and the health of the community can be attained at low cost. Ideally, Melvin and other community leaders eventually want a functioning aqueduct system; however in the meantime, they view solar purification as a viable substitute.

Living in the community of Ustupu as a Peace Corps volunteer for two years revealed the complex problems surrounding contaminated drinking water. However, appropriate solutions can be found. It is likely that this method of water purification can be sustained over time. As we have seen here, understanding local knowledge and practices is essential. Indigenous leaders like Melvin apply local knowledge to specific problems, in this case water purification. In addition, grass roots health education is also very important as a means to make information available in the community. It is possible to prevent water-borne diseases given the right combination of infrastructure, cultural sensitivity, and local leadership.