

Water for People Conference Presentation

Written Presentation Supplement

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On behalf of the

Los Toros Water Committee, Los Toros, DR

Introduction

Los Toros, a village of about 6,000 residents, is located in the southwestern province of Azua, Dominican Republic. Its economy is mostly agrarian, though there are a number of small businesses and shops in the village. Poverty is common in Los Toros and the village has many needs. Many homes have dirt floors, families live in crowded conditions, few homes have indoor plumbing and bathrooms, and children lack clothes and shoes to attend school. Donald Kabara, of Grafton, Wisconsin, recognized these needs when he first visited Los Toros in the late 1980s.

The Los Toros Mission, then a partnership between the village of Los Toros and St. Joseph's Catholic Church of Grafton, Wisconsin, began its work in 1988. Since then, The Los Toros Mission has attained the status of a private, non-profit corporation and is now known as the Los Toros Foundation, Inc. The Los Toros Foundation is legally chartered both in the State of Wisconsin and in the Dominican Republic.

Los Toros is a tight-knit community that has many village leaders who are passionately involved in making Los Toros a better place for future generations. These village leaders have worked closely with Mr. Kabara over the years and have formed a number of committees that focus on community development. Some of these projects include a literacy initiative

that yielded a community library, a health project that focused on getting cement floors in homes, and ongoing sewing education classes for young women in the village. More recently, water quality was seen as an issue that needed to be addressed within Los Toros. In June 2006, the Los Toros Foundation began its first formal efforts at finding a solution to water accessibility and quality deficits.

Since then the Los Toros Water Committee has been formed, headed by Isidora Antonia De Leon Feliz. The Water Committee works with the Los Toros Foundation's Water Project US Lead, Peter Bennett. The Water Committee works in concert with the Los Toros Foundation to determine needs and carries out filter procurement and education efforts in Los Toros. The committee also distributes filters to those most in need and collects payment of the partial fees residents of Los Toros pay for filters.

The Aqueduct

The Azua province of the Dominican Republic is very impoverished. Despite this, Los Toros has access to one resource many rural villages in the Dominican Republic do not: an aqueduct. The aqueduct was built by INAPA about 25 years ago. In addition to serving Los Toros, the aqueduct serves three other villages: Las Guanabanas, Sajanoa, and Tabarra Arriba. While this resource is valuable to Los Toros, it is unreliable.

Members of the Los Toros Foundation, along with members of Marquette University's Engineers Without Borders (EWB) have surveyed the aqueduct (see **Further Reading**). There are numerous breaks in the pipeline running from the aqueduct's water source. The surveys have included marking key parts of the aqueduct and village with GPS, drawing schematics of key parts of the aqueduct, and documenting damaged areas of the aqueduct. to the edge of the village. Additionally, there are numerous breaks in the pipelines running throughout Los Toros. All of these breaks allow for the possibility of water contamination from nearby crop and livestock runoff. Fecal coliform tests conducted by the Los Toros Foundation and EWB have shown that water supplied by the aqueduct is contaminated and not safe for human consumption directly from village water taps.

The aqueduct was designed to allow for chlorination of the water before it reaches the village, but the facilities for chlorination are not currently in use and are in a state of disrepair. Los Toros' village plumber, paid by INAPA, periodically (but irregularly) adds powdered chlorine to one of the storage tanks along the aqueduct. Given all of the breaks in the pipelines and inconsistency of chlorine treatment, it is unclear whether or not the chlorine adequately disinfects the village's water supply.

Other aqueduct shortcomings include periodic water shortages in the village when the weather is dry and very turbid water when it rains heavily. Water distribution throughout the village is inconsistent—some parts may

have adequate water supplies, while others may simultaneously have no water. Some more remote parts of the village do not even have access to pipelines and residents are either forced to transport water or get it from local, unclean waterways. Many people who do have pipelines have water spigots that do not shut off, so water is often wasted. Broken pipes in the village lead to stagnant pools of water, which can become breeding grounds for disease-carrying mosquitoes and insects. Finally, local farmers may or may not be diverting aqueduct water for agricultural purposes, which may contribute to the periodic water shortages.

Water Treatment

Bottled Water

Since the aqueduct's water is not safe for human consumption, the people of Los Toros have met their water needs in other ways. One quite popular, but costly way, is to purchase 5-gallon containers of purified water (*botellas*) from local *colmados* at a cost of RD\$ 30. Families usually purchase three or four per week. While the cost is less than a dollar per bottle, depending on the size of the family, this one container may not meet drinking water needs and certainly doesn't meet bathing and household cleaning needs. Families who are especially poor cannot afford this option. While the bottled water insures people are drinking safe water, it is costly. A less costly water source would allow money spent on bottled water to be spent on other household necessities, food, education related expenses, and

transportation, among other things (see "*Economic Implications*" in **Further Reading**).

Bucket (String) Filters

One alternative to bottled water is the use of two-stage bucket filters. These filters (costing about RD\$ 360) have two filter elements (one inside of each bucket) that remove particulate matter (via a string filter) and organic compounds and chlorine (via a carbon filter). Research by the Los Toros Foundation conducted at Marquette University's Water Quality Center (see **Resources**) found that in order for this system to work properly, water must be chlorinated for an hour prior to being run through the filter.

This filtration system works well when used properly, but due to inconsistent training and the somewhat complicated set of steps necessary for proper use, many people were not using the bucket filters correctly. Investigation into the use of bucket filters found inconsistent methods for decontaminating water. Some people used chlorine, while others mistakenly used vinegar to disinfect the water, while others used nothing but the filter elements to clean the water either because they did not know to use chlorine or did not like the taste. Not surprisingly, tests for fecal coliform run on water filtered through bucket filters found water to still be unsafe for drinking in many cases. (see "*Water Systems*" in **Further Reading**) Efforts at improving the usage of these filters through education have shown inconsistent results.

Additionally, there have been supply problems with the bucket filters. The Los Toros Foundation was able to procure some within the first year of efforts to improve water in Los Toros. However, the Foundation was unable to procure more filters after this. A program run by the Diocese of San Juan in the Dominican Republic distributed these bucket filters while the Diocese of Orlando in Florida supplied the filters to the Diocese of San Juan. After it became clear the Diocese of San Juan could not meet Los Toros' need for filters, the Los Toros Foundation began to look into other filter technologies. A meeting with Plan International, in Azua, in May 2007 led the Los Toros Foundation to begin investigating the use of ceramic filters.

Ceramic Filters

Investigation into ceramic filter technology revealed that silver-impregnated ceramic filters are effective at removing disease causing pathogens and making water safe to drink (see "Potters For Peace Studies" in **Resources**). The Los Toros Foundation contacted Potters for Peace (PFP), a non-profit organization that helps people of developing nations start ceramic filter factories. Potters for Peace advised and assisted residents of Yamasa, Dominican Republic in the set-up one of these factories. The Foundation was able to contact the Yamasa filter factory and procure a few of their silver-impregnated ceramic filters. A secondary benefit to choosing these filters is that they are made in the Dominican Republic and their purchase supports the country's economy and the livelihood of other

Dominicans. Supporting sustainable development in other parts of the Dominican Republic is highly valued by the Los Toros Foundation.

These filters were tested in resident's homes in Los Toros and received favorable reviews. The filters are reported to be much easier to use than the bucket filters and do not require the use of chlorine. Residents have reported the water from ceramic filters tastes better than the water from bucket filters. Independent laboratory tests on one of PFP's filters at Marquette University's Water Quality Center found the silver-impregnated filter to be effective at producing potable water. The Los Toros Foundation acquired 25 more ceramic filters and distributed them throughout the village. Efforts are underway to acquire more of these filters for wider distribution.

Future Objectives

The **short-term** goals of the Los Toros Foundation Water Project are as follows:

- Procure more silver-impregnated ceramic filters domestically (within the Dominican Republic) from PFP for residents in need in Los Toros
- Ensure that there are ample replacement filter elements and components in Los Toros for ceramic filters
- Educate people on the importance of having safe drinking water and methods of making their water safe to drink
- Educate people on proper bucket filter and ceramic filter usage
- Educate people on the importance of hygiene and proper sanitation

- Fix broken water taps and educate on the consequences of water misuse (breeding ground for disease-carrying insects and decreased water pressure)

The **long-term** goals of the Los Toros Foundation Water Project are as follows:

- Repair broken sections of the aqueduct
- Improve the reliability of the aqueduct and ensure water pressure is adequate throughout Los Toros
- Once breaks in the aqueduct are repaired, begin to chlorinate the water, so potable water is available straight from the tap
- Improve human waste and trash disposal in Los Toros
- Reduce incidence of illnesses and deaths in Los Toros related to unclean water through continuing innovation in safe water technology

Since Los Toros is fortunate enough to have an aqueduct, it would be a waste to let it fall into further disrepair. Doing so might require the entire system to be reconstructed—an undertaking that would certainly be more costly than repairing the aqueduct. Investing in repairs to the aqueduct will ensure that residents of Los Toros will have long-term access to clean water for drinking, bathing, and other household uses.

More recently, the Los Toros Foundation has recognized that human waste disposal practices may be harming ground water in Los Toros. We have not been able to directly assess or test for negative impacts on groundwater, but the Foundation suspects that latrines and basic septic

systems may be contaminating ground water. This is of particular concern due to the sizeable number of Los Toros residents who get their water from local waterways—not from the aqueduct. Contamination associated with human waste would certainly have negative impacts on health. The Los Toros Foundation would like to begin studying the impacts that latrines and other human waste disposal practices have on groundwater in Los Toros. We are seeking funding of US \$2,500.00 for this action and technical assistance.

Need for Assistance

While the Los Toros Foundation has made great preliminary strides in identifying deficits in Los Toros' water quality and supply system, and has found better in-home filtration technology, there are many needs that remain to be met in Los Toros. Some of these needs, such as studying the effects of latrines on groundwater and improving the aqueduct's pipes and chlorination ability are projects beyond the scope of the Los Toros Foundation's expertise. Technical assistance from Water for People would allow the Los Toros Foundation to begin to find solutions to these problems. These are long-term projects that will certainly benefit Los Toros for years to come, not to mention other villages that utilize the aqueduct. However, there are short-term projects that the Los Toros Foundation is currently working on that could begin improving water quality and residents' health immediately.

Funding, in the amount of US \$2,000.00, for the purchase of more silver-impregnated ceramic filters at a cost of US \$20.00 (RD \$700.00) per filter, for the neediest families in Los Toros would immediately change those families' lives for the better. Note that, families pay RD \$200.00 of the total RD \$700.00 cost. These families would no longer need to worry about water-borne illnesses preventing their children from attending school. Money that would have otherwise been spent by these families on water can now be spent on other important needs, such as improving shelter. Immediate funding would also allow the Water Committee to publish proper filter use and maintenance materials as well as educate village residents on proper hygiene and sanitation practices. Funding of US \$500.00 is needed for the Water Committee to pay for communication costs and transportation costs associated with procuring more filters, training, and education.

Studies done by the Los Toros Foundation and Marquette University's EWB Chapter need follow up. Specifically, the Los Toros Foundation would like to have a consistent water quality assessment program to ensure that residents have access to safe water. Being able to monitor changes in water quality in the aqueduct could lead to fewer health problems. The Los Toros Foundation would also like to work cooperatively with local farmers to ensure that their irrigation needs do not interfere with residents' ability to have consistent access to water.

A study done by Philip Ritger, then of Marquette University's chapter of EWB, entitled "Water System Improvement Project: Los Toros, Dominican Republic, Assessment Report—Phase 1" (see "*Water Systems*" in **Further Reading**) made a number of recommendations beyond simply improving water quality through filtration. His assessment suggested that improving the water supply system's ability to consistently deliver water to the village is the greatest priority. His report suggested the following:

- Reduce water waste and misuse within the village by installing functioning taps
- Quantify Los Toros' water use by conducting household water usage surveys and installing flow meters in the aqueduct
- Utilizing a defunct chlorination tank as a storage tank to dampen water surges during heavy rains and to store water during dry periods; or build a water tower to increase water pressure
- An in-depth survey of the aqueduct to determine if it needs to be retrofitted in order to avoid future system failures
- An in-depth study of the water distribution system in the village to determine reasons that parts of the village have no water pressure while other parts simultaneously have adequate pressure

These more technical engineering surveys are beyond the scope of the Los Toros Foundation. Water for People's technical expertise could contribute greatly to the solution of these long-term water quality improvements for the village of Los Toros. The Los Tors Foundation sincerely hopes we will be able to forge a lasting working partnership with Water for People in our efforts to bring Los Toros a sustainable drinkable water program.

To summarize, we seek financial assistance for our current water filter and education project in the amount of US \$2,500.00. We also seek financial aid in the amount of US \$2,500.00 for assistance in engineering long-term solutions to water quality and distribution problems. We feel the village of Los Toros can serve as a model for future development in clean water innovation within the Dominican Republic.

Further Reading

For more information on the Los Toros Foundation's work on solving Los Toros' water problems and our collaborative work with the Marquette University chapter of Engineers Without Borders, read these documents:

- *Water System Improvement Project: Los Toros, Dominican Republic, Assessment Report—Phase 1* **by Philip Ritger, EWB**
- *Economic Implications and Recommendations Regarding Los Toros' Water Infrastructure: Assessment from January 2007 Visit to Los Toros, Dominican Republic* **by Peter Bennett, LTF**

Los Toros Foundation Website

- <http://lostorosfoundation.org/>

Resources

- Marquette Water Quality Center
http://www.marquette.edu/engineering/pages/AllYouNeed/Civil_Environmental/Labs/WQC.html
- Potters For Peace Studies
http://s189535770.onlinehome.us/pottersforpeace/?page_id=25

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