

Cody Morgan, Student Participant
Wayne Community High School
Corydon, IA

Sustainable Watering of Rural Farms and Citizens in Ethiopia

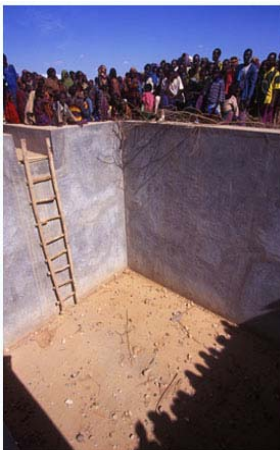


This is six-year-old Buzayan who lives with her mother Sheba, two sisters, and one brother in the Ethiopian highland village of Akaki. Her mother spends a major part of the family's income (American \$12 per month) sending Buzayan and her sister to school. Her parents have had no education. When Buzayan was asked about kindergarten, she squealed with delight and started jumping up and down. This is the story for many rural poor in Africa: large families, little income, poor health, yet the will to learn. Buzayan's poor living conditions, yet her ability to love life have inspired me in writing this paper.

Welcome to Ethiopia.



Welcome to my world; my name is Sheba, and this is my story. It is morning, hours before the sun will rise to scorch the drought-ridden land. I go to the far side of the hut and quietly wake Buzayan, my eldest daughter. Usually my husband Haile would be out taking the cows to pasture, but civil war has erupted in our area; so he and most of our husbands in our small village of 120 left to fight for our freedom, leaving all but five of the houses to be headed by their wives. Without waking the rest of the children we leave our one-room stone hut to hike the rugged two-hour journey east to the local well. We take this journey every morning so that my children and our two cows can survive to see another day. We leave the hut and walk down the side of the mountain. My daughter and I meet up with four other mothers of the village. Together we head north to the area well.



As we step over the crest of the hill before the well, we see through the darkness that someone else has gotten here before us. We walk down to see our closest neighbor Menen and her daughter lowering the bucket to the bottom of the well. As the rope goes slack, she pulls it back to the opening. By the time the bucket reaches the mouth of the well, two more of our neighbors have arrived. When we see the bucket, stunned silence reaches our mouths because when Menen pulls the bucket over the side, it is bone dry except for the small streak of mud on the side where it hit the bottom.

The silence is broken as Menen's daughter falls to the ground and starts to weep. This is horrible; the nearest water to our home is Lake Beseka, and it is fifteen miles away. Beseka is a small saltwater lake that is about to overflow its borders and taint an entire nearby river. Now with this ongoing drought, surely our village will disappear. Where will we find water now?

Sadly Sheba's story is true for some 25 million Ethiopians. During the Ethiopian year, the country suffers severe droughts and famine eight out of twelve months. Thousands of Ethiopians die every winter from the lack of water or poor sanitation that causes disease. Most Ethiopians don't have enough water to wet their ragged clothes. So far this year during one of the worst droughts since 1985 in the country, an alarming 10 million people have been affected. On the other end of the spectrum during the rest of the year, Ethiopians suffer from monsoons from early June to late September. Just this August, floods killed thousands and displaced over a hundred thousand. Due to this staggering change in precipitation during the year it is extremely hard for the citizens of Ethiopia to be able to grow and maintain a suitable agricultural industry.

Monsoon Season



Drought Season



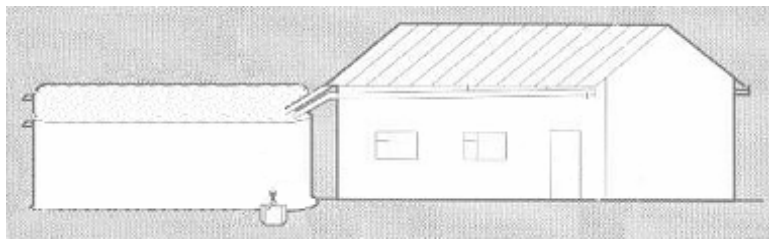
In Ethiopia the main source of livelihood is agriculture. Over eighty percent of Ethiopia's 68.6 million citizens grow or process crops to survive. Those farmers' average land holdings are two and a half acres per family. Some of the crops that they grow are: coffee, cereals, maize, sorghum, wheat, barley and millet. Coffee is the main crop with over 800,000 small farmers providing eighty-five percent of the exported coffee. Their potential is much higher than they currently are producing; of the nation's total land, forty-five percent of the ground is arable, but only eleven percent of it is cultivated, and unfortunately only one percent of that land is irrigated. The agricultural citizens who don't farm or process plants for income are herders. Ethiopia is a mountainous nation, and as such over 60 percent of its land is used for herding cows, sheep, and goats. Many of the country's seven million herders are impoverished, and over twenty percent of these herding families are headed by women. Many of the small farms have two or three small cows for milk or for plowing. Families like Buzayan's very well could be next on the list of dead after the next drought. If these people had a means of withholding monsoon rain from the thirsty ground, by means of catchment pools or dams, it would be much easier for them to thrive and prosper. What solutions are available for Ethiopians' dire winter water shortage?



Ethiopia's main problem is lack of water. In the central regions the Ethiopians have access to many rivers, and even a few lakes, but their problem is rain. Ethiopia is one of many countries that suffer through a long monsoon season, and then a long hard drought. John Mbugua, the creator of the Kenyan "Rainwater Catchment System," has given me an idea of a way to utilize the rainy season in Ethiopia, and possibly provide the country with enough water to quench the nation's thirst for the entire

year after the monsoon without the women of the households having to hike several miles to carry fifty-pound water buckets back.

My idea is similar to the “Rainwater Catchment System” which is a way to collect rainwater that is now in use throughout many villages in Kenya. I would use galvanized tin, aluminum, or maybe even cheap palm branches to make a roof for each house. Then the rainwater will fall into the gutters of the house, and be funneled into a huge storage pool for each house. To make the pool easy to build and be watertight, the family would make a circle of stones, or any available building material. Villagers would need a form of concrete to hold the stones and make it watertight, and also possibly plastic, or clay bricks to keep the interior sterile. How would they get that concrete? Small business loans could be applied for through the Food and Agriculture Organization of the United Nations, World Bank, Peace Corps, or even several smaller organizations such as churches and mosques. Also the pool would need a roof, and mosquito netting to cover any openings. The villagers would use the concrete and trowel it over the roof-high wall. When the wall has become fully stable, they would put a plastic liner or some other form of watertight sanitary means for the inside of the pool. As for obtaining the water, support groups would need to supply the builders with access to purchase a simple spigot. Villagers who wanted to create a catchment pool would be taught by other Ethiopians who have built or overseen the creation of this system themselves. Again, groups such as Peace Corps Volunteers or FAO teams (U.N.’s Food and Agriculture Organization) could help facilitate this communication process. I think that learning is most successful when people do all they can for themselves, when the farmers themselves have full participation. Frank Laubach’s World Literacy Program was successful with the motto “Each one, teach one.” That’s the model that I recommend.



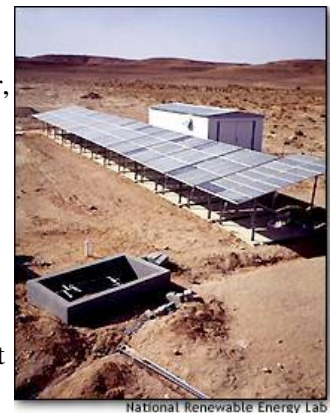
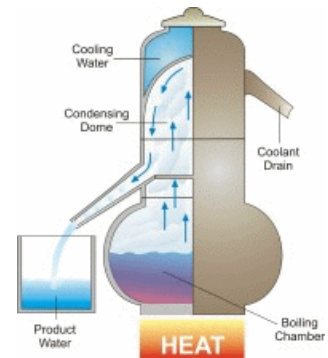
With the “Rainwater Catchment System” the lives of many Ethiopians would be much better. With access to reliable water, families would be able to water their crops and livestock. This would also prove a means of repaying the loans given to them from the support organizations; these families could use the extra money from the healthier crops and animals to alleviate that debt. Currently, women spend several hours each day collecting water from distant dams and wells, sharing the water source with animals that drink from it and contaminate it. Women in small villages would have available water for gardens that were once thought impossible. With these gardens, their families would be able to have much healthier lives with healthy diets and cleaner water. Children would live longer, healthier lives because they would be able to bathe and they would have clean water to drink rather than having to drink water from a pit in a river or a well that has been exposed to the elements. Families would now have the ability to wash their clothes and keep their dishes clean which would lessen the bacteria on them. According to returned Peace Corps Volunteer, Dr. Robert Blount, “Facial dirt is the major cause of trachoma, a very contagious eye disease rampant in East Africa. Trachoma causes blindness and is most common among children who don’t have enough water to wash their faces and hands.” Also, Ethiopians would now have water to use in repairing their homes since most of the houses in poor areas use mud or clay for a binding agent and over time that disintegrates, or is washed away.

Yet another way of collecting and utilizing water would be to construct small dams on small rivers. This water then could be fed into smaller channels creating reservoir ponds. Damming rivers is already in use throughout the area, and is an easy way to collect water, but is one of the most dangerous ways of doing so. This would be one of my most dangerous ideas because floods could destroy the dams and release the stored up water onto downriver towns and farms. To lessen the chances of this problem, I



wouldn't completely dam up the river, but leave a narrow gap near the center, and top of the dam. This way, the water will swell, but not be contained to hazardous levels. To make the dams, all that the people would need to do would be to pile up rocks along an easy flowing section of the river. The rocks would need to be reinforced with cement so the dam itself would hold in flood waters. Gradually the river would swell behind the dam and the people would be able to collect as much water as they pleased. With this system, women wouldn't have to travel as far to get to the water that they need every day, and would be able to have small gardens in which they could plant crops that would boost the health of their families. An example of this is the woman holding large healthy cabbages in the picture above. A dam was built on the river near her house, and now the villagers have enough water throughout the year to water their gardens and livestock. This is one of the many success stories throughout that area where water storage saves lives.

Finally, for a possible solution at Lake Beseka, where the water mysteriously has become highly saline, I would create a huge desalination plant near the lake. This plant would be solely run on solar energy. All the energy needed to get the saline water to the plant would be obtained by the solar panels situated on the plant's roof. The plant would use some of the energy from the solar panels to pump the saline water into the small boiler so that it can be evaporated. When the plant needed water, a valve would be turned automatically to release the water into a small boiler. All that this would be is a large metal pot with a solar powered electric burner beneath it. When the water is dumped into this boiler, it will be quickly heated up to boiling, and then the steam will rise up to a cooling plate that will be situated over the boiler. When the steam condenses onto this plate, it will be completely free of contaminants and salt. The plate would be situated at enough of an angle that the water would then pour into a large sterile container, which would be easy to transport once full to local villages without access to clean, safe drinking water. All that the Ethiopians would have to do with this system would be to clean the boiler and bring the clean water to villagers. Desalination of Lake Beseka would need a much more comprehensive loan from the United Nations or World Bank because of the initial cost for producing the system, but once it is up and running, the system will need little more income to produce clean drinkable water. Present examples of this system would be the Ashkelon Desalination Plant in Israel, which is the largest desalination plant in the world. These desalination plants are fairly common, with 7,500 plants worldwide and growing each year. Pictured here is a solar-powered Saudi Arabia site which uses the energy from the solar panels to pump salt water, which is then turned into fresh water via a desalination system. This system is currently effective, economical, and proven to provide clean water.



The ideas in this paper are only some of the solutions that I have thought of for helping the world. In my future, I hope to be able to travel to these struggling countries and use my knowledge in math and science, along with my interest in renewable energy, to help people like Buzayan and her family. With a "Rainwater Catchment System," or a small dam, or the desalination of Lake Beseka, Buzayan's family could water their livestock, their garden, and their lives. If the U.N., World Bank, and Peace Corps, along with religious organizations, could provide loans to farm families, rural Ethiopians would be able to create better, stronger, and more sustainable water sources by teaching each other. I feel privileged to have been able to write this paper, and look forward to meeting all the great people that have helped start so many different movements to help the poor, feed the hungry, and provide a brighter tomorrow for the world.

Bibliography

Blount, Dr. Robert. Telephone interview. 12 September 2006.

Blue Nile Falls. Thea Demanuele. Photo.

<http://mapx.map.vgd.gov.lv/geo3/Ukr/Pamatlapas_Slices/Arzemes_E/Arzemes_E.htm>.

Buzayan. The Bowers Museum. Request for copyright permission in process. Photo.

<http://bowers.org/exhibits/exhibit_bridges3.asp>.

The Bowers Museum. "BRIDGES to Understanding." Past Exhibits. 2005. The Bowers Museum.

August 20, 2006. <http://bowers.org/exhibits/exhibit_bridges3.asp>.

Catchment System. Ben. Photo. <www.pacificworlds.com/cnmi/land/water.cfm>.

Desalination Plant Illustration. Illustration. Information unavailable.

Empty Well in Imi. Patrick Barth. Photo. <<http://www.firstphoto.co.uk/view/ethi01.html>>.

Evangelical Lutheran Church in America (ELCA). "Ethiopia." Country Packets. No date. Evangelical Lutheran Church in America. July 28, 2006.

<<http://www.elca.org/countrypackets/ethiopia/desc.html>>.

A family that left their village in search for food. Patrick Barth. Photo.

<<http://www.firstphoto.co.uk/view/ethi01.html>>.

Gould, John and Nissen-Petersen, Erik. "Heavens Above – Kenya." January 2000. UK Department for International Development (DFID). May 29, 2006. <<http://www.tve.org/ho/doc.cfm?aid=536>>.

Kenyan Solar Desalination plant. Photo. Information unavailable.

Laubach, Frank. Each One Teach One. New York: Longmans, Green & Company, 1954.

Matema Gondor Mountains. Photo. Mark Tanner. <marktanner.com/travels/ethiopia.html>.

Rainwater Catchment Systems for Domestic Supply. John Gould and Erik Nissen-Petersen. No date.

Edited by Cody Morgan. <<http://www.tve.org/ho/doc.cfm?aid=536>>.

WFP: Flooding in Ethiopia. Melese Awoke.

< <http://www.wfp.org/english/?ModuleID=137&Key=2222> >.

Woman Gardening. Siiqqee Woman Development Program. Photo.

<www.siiqqee.org/Programmes.htm>.

The World Bank Group, "Water Problems, Poverty Linked." World Bank Report: Lack of infrastructure holding back developing world. 2006. The World Bank. July 28, 2006.

<<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/0,,contentMDK:20856041~pagePK:148956~piPK:216618~theSitePK:336992,00.html>>.

World Food Programme. "WFP says Ethiopia flooding far from over: 118,000 affected." News - Press Release. August, 2006. U.N. World Food Programme. August 24, 2006.

<<http://www.wfp.org/english/?ModuleID=137&Key=2222>>.

World Food Programme. "Ethiopia: More Than 10 Million Lives at Risk." In Depth. September, 2006. U.N. World Food Programme. September 2, 2006.

<http://www.wfp.org/newsroom/in_depth/Ethiopia.asp?section=2&sub_section=2>.