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Confronting Tanzania's Water Crisis

Just add water! Think how many products tout this phrase in the United States. Foods, beverages, dyes, cleaning products, and toys all contain this label – but we never think about it. After all, this key ingredient gushes plentifully with the mere turn of a knob. Now imagine living in a country where anything with this label was impractical, because clean water is not only expensive, but often unavailable. Such is life in Tanzania, where only 55% of households have “access to improved water sources” (MDG Monitor, 2007). Without a ready supply of clean water, disease runs rampant, crops and livestock are poisoned, and time and money for work and school slip away, lost in the never-ending quest to acquire and purify enough of this substance we depend on so heavily. Though NGOs and government programs are improving conditions, water sources need to be cleaned and methods of purification perfected in order to keep pace with demands of population growth and urbanization.

According to the 2004-2005 Tanzanian Demographic Health Survey (TDHS), the mean size for a rural Tanzanian family is five people. However, families with nine or more people make up 10.3% of the rural population, a significant number. Sixty-two percent of rural families include both parents, but many have one or none. In addition to children, many families have elderly relatives residing with them as well. While most people reported getting three meals per day, 41.9 % ate two or less, and over half said they had not eaten meat in the last week. Also, only 36.8% reported that they could always feed their families. By far the most common Tanzanian meal is the corn porridge known as ugali, the grain for which is almost always grown on the .9-3.0 hectare family farm, dependent on rain for water and human labor to break the ground, plant, weed, and harvest (Tanzania National Website, 2005) Other crops include legumes, such as peanuts, coffee, rice, vegetables, and various others depending on the region of the country (Tanzania National Website,2005) . Due to the need for all this manual labor, many rural children attend little, if any, primary school. On average, girls are able to attend 2.4 years and boys 3.2 (TDHS,2005). Access to healthcare is also limited. Most clinics serve large rural regions, and Clinical Officers who run them are only required to have three years of basic training (Brigley,2009). In addition, healthcare costs, though reduced by a new government insurance program, still often exceed the budgets of the destitute (Msuya,2007).

These farmers face many difficulties in their struggle to earn a living. Besides the difficulty of the work, they face unpredictable weather, with frequent droughts and floods. Pests and disease cause problems for plants, animals, and humans. Water-borne pathogens and diseases transmitted by lack of hygiene, such as HIV/AIDS which infects 6.2% of Tanzanian adults (MDG Monitor, 2007),run rampant. These diseases take workers away from the fields, decreasing their already slim chances of making a profit. Economics also poses a threat. Farmers are dependent on crop prices, especially those who cultivate cash crops. Fluctuations in the price of coffee, a principle export crop, leave farmers insecure about their income. Many rural residents lack access to profitable markets. In addition, Tanzanian farmers lack capital or credit to restart in case of a bad year.

Above all, Tanzanians lack clean water. One-third of the country is considered arid, and all of Tanzania is subject to periodic droughts and flooding, both of which limit the supply of clean water (Tanzania National Website, 2005). Water-borne diseases take workers away from the field and can cause chronic health problems or even death. Even plants grown in polluted water absorb some toxins, leading to still more problems (Dickinson, 2003). Without a steady supply of water, crops wither or drown and the family income is lost. Without this income, families cannot afford health care, school fees, seeds for the next year, or even food. To access clean water, many families must walk long distances, pay usage fees

out of their limited incomes, or boil polluted water to make it safe. Even this third solution can be costly in areas where fuel is scarce. When money is tight, many poor Tanzanians have no choice but to use contaminated water. According to one local Tanzanian health officer, the people in his region “now understand the dangers, but they probably carry on using this water as they are so poor, and cannot afford water from other sources.”(Dickinson, 2003) Increasing access to clean water supplies will not only improve the population’s health, but allow them to increase their income, and thereby their access to education and food security.

The problem in Tanzania is not as simple as a lack of water. The country has a plentiful water supply from rivers, lakes, streams, and aquifers (Tanzania National Website, 2005). The crisis is that many of these sources contain pollution from industrial toxins, outdated sewage systems, and agricultural wastes. Traditional purification by boiling can be expensive, and also degrades the environment by removing trees for fuel. Since living trees transpire water back into the air, cutting down enough trees to boil away impurities in all the polluted Tanzanian water, would not only be unfeasible, but could also worsen problems of drought and flooding.

To illustrate the severity of the problem, consider Nyamotando Gaspari who lives in Mwanza, Tanzania. She now has her own private tap, thanks to a local charity, but once had to pay for water from a local tap or walk half a mile to get water from Lake Victoria, then boil the water to purify it. When not enough water was available, her family sometimes had to skip bathing. When they lacked money to buy fuel, they drank the polluted lake water. Both increase chances of disease. Nyamotando lost two children to unknown diseases, and the others often contracted diarrhea. The water in the lake is used to supply water to over 200,000 people and is polluted by sewage since the city’s sewer system broke down. Though the water is chlorinated to kill toxins, this process does not necessarily reach all the city water, and little to no filtering takes place. Therefore, even though Nyamotando now has her own tap, she still needs to boil its water before drinking, though it is safe for washing, laundry, and watering the vegetables she sells for a living (Plummer, 1999).

Despite the inconvenience of boiling her tap water, life is much better for Nyamotando. Her children are healthier. She has less trouble from back problems caused by carrying water. She has more time to sell vegetables, and her daughter has more time for schoolwork. She can even sell her water to some of the neighbors, earning extra money to put her younger children through school and feed their growing appetites (Plummer 1999).

Though water quality has improved in recent years due to work by government programs and NGOs, many areas still lack sufficient water. Rural areas are particularly disadvantaged. Development work has focused primarily on purifying city water systems, while rivers and streams used by rural residents go unnoticed. These water sources are often used for laundry, livestock, and waste removal, contributing to the spread of diseases such as typhoid and cholera. When a source of water becomes utterly too polluted to use, the most common remedy is to find a new one, whether by walking a longer distance to find water, or by using NGO or government money to drill a new well or pump water from a cleaner spring. This method is costly, and clean water sources are limited. While it satisfies the demand for clean water temporarily, if the supply is not carefully tended, it will become polluted as well (Lemery, 2011).

As Tanzania’s population continues to grow and industrialize so will the demand for water and the amount of pollution. Climate change will produce even more radical cycles of droughts and flooding. Unless pollution is drastically reduced, water sources are cleaned, and water purification methods become much more readily available, the Tanzanian poor will suffer. Epidemics of water-borne diseases will break out. Women and children will spend more of their precious time fetching water that is not there instead of earning money or learning. Irrigation will remain unfeasible, because plants will be contaminated by the water they are grown in. Though the situation is currently improving, if trends of

improvement do not keep pace with the demands of urbanization and population growth, the situation will take a turn for the worse.

Therefore, change is necessary. Tanzania needs to begin by cleaning up the rivers. This would require a public policy initiative to prevent factories from dumping untreated waste into water sources. City sewage systems must be fixed so they no longer outlet into water sources, at least not without being treated. Next, farmers need education about how to keep trash, soil and fertilizer from contaminating the rivers and lakes. Contour farming, where land is plowed horizontally with the contour of the land instead of downhill, which speeds runoff and pollution, and agriforestry, the intermingling of trees and crops, are two useful methods. Agriforestry is especially useful because the trees provide shade for shade-loving crops, retain fertile topsoil with their expansive root systems, and sometimes replenish soil nitrogen content or produce crops themselves. Then clean-up crews can help to remove trash and clean up the waterways. Wherever possible, these efforts should be led by Tanzanians, so the movement remains sustainable and community-based.

Families also need education in proper food preparation methods that kill harmful bacteria and other disease causing microorganisms. These include basics such as washing hands before cooking, keeping foods separate while cooking to avoid cross-contamination, and cooking foods to proper temperatures (WHO, 2011). However, they first need the tools to carry out these precautions. It is quite difficult to wash one's hands without soap or clean water or avoid cross-contamination with a limited number of utensils and no counter space. Unfortunately, many food safety tips advised in developed countries are impractical in developing countries where packaged goods with expiration dates, refrigeration, and the Food and Drug Administration are virtually non-existent. Difficult though this may be, education in food safety is especially empowering for women, who prepare all Tanzanian meals. This knowledge can help them keep their families healthy and gain respect in their communities.

Next, scientists and engineers need to develop affordable, efficient, and durable ways to purify water in a country with little to no electricity. As of now, four main non-electric methods for purifying water exist: boiling, filtration and chlorination, the solar still, and a solar-powered filtration and UV-purification system. As mentioned before, boiling uses precious fuel. Filtration and chlorination, the most common method in the United States, can be cheap and efficient, but may not remove all impurities when the water is especially dirty (UNESCO, 2011). The solar still uses the sun to evaporate the clean water onto a cover then condenses it into a cup. Though the water is cheap and 100% purified, this method is horribly inefficient. When I attempted to make one, my efficiency was .07% (See Appendix A). Though mine had several flaws, they simply are not a particularly viable option. Solar-powered filtration and UV-purification devices, such as those developed by AquaSun work thoroughly and efficiently, but are more expensive, and have parts that need to be replaced annually (AquaSun, 2011). Clearly, each has its advantages and disadvantages, but if any are to work people must be able to access, operate, and sometimes construct them. I feel that charities, NGOS, and government agencies should be responsible for making these devices available to the public and educating people in their uses.

Finally, if organizations such as World Bank would help the Tanzanian government invest in expanding and updating its water treatment and distribution infrastructure, Tanzania's cities could have clean, reliable water. This would help millions of poor urban residents by giving them better sanitation, more time, and therefore a chance to improve their livelihoods.

Truly, clean water could be the key to Tanzania's success. Presently, the country has a Third World status, struggling with food security, epidemics, weather conditions and countless other issues, most of which can be attributed, directly or indirectly, to a lack of clean water. Many developing countries struggle to provide potable water to their citizens, but Tanzania has one important advantage: peace. With a stable government and peaceful reputation, Tanzania has the ideal time and organization for NGOs

to help. If the implemented strategies succeed, they can be tested in other developing countries. Imagine the learning that young students could acquire if they were in school instead of home sick with water-borne disease. Imagine how much a family's income and food security could be improved by using the time and energy currently used for acquiring clean water to work instead. Imagine the food that could be produced, even when rain is unpredictable, in a field irrigated by clean water. When the country's water sources are cleaned, the methods to purify water available to the common people, and the infrastructure to distribute clean water in place and in good maintenance, such things could be possible. Perhaps this label could be put on Tanzania: Instant Transformation! Just add water!

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Appendix A

When researching methods of water purification, the inefficiency of solar stills astonished me. Attempts recorded on the International Year of Chemistry website ranged from .01% to 6% efficient. I decided to try my own to gain a better understanding.



Materials Used

- 41 cm (diameter) metallic bowl
- 13 cm ceramic bowl
- plastic wrap
- pebble
- 1500 ml pond water
- graduated cylinder
- funnel

Procedure

1. Filled larger bowl with 1500 ml dirty pond water.
2. Placed smaller bowl in large bowl so it sat in water but was not submersed.
3. Covered large bowl with plastic wrap. Placed pebble directly over smaller bowl, making a gradual funnel towards smaller bowl.
4. Still remained in full sunlight for 2.5 hours.
5. Using the funnel and cylinder to measure the water condensed in the smaller bowl, I obtained approximately 1 ml clean water.
6. $1\text{ml}/1500\text{ml} = .07\%$ efficiency

Though my experiment had some error when measuring the final clean water, the results were most definitely inefficient. I realize that with better materials, a black bowl instead of a metallic one for example, I might obtain better results, but I worked with materials I had at home. Poor rural families would have less choice in their supplies than I did.