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Mexico: Water Management Practices to Increase the Supply and Reduce the Use

Goal! Mexico's soccer team has just scored another goal before the half to put them ahead by one. How exciting this is for everyone who is watching the game in the village plaza. A boy named Santiago celebrates with his friends, another magnificent goal by their beloved soccer team. Everyone in the village is ecstatic and going wild as Santiago heads home. His day will begin early in the morning as he struggles to manage the family's small farm with a limited supply of clean water. Everyone in the region is affected by a lack of clean and affordable water. Enthusiasm for soccer is not the only common tie within the community.

Most Americans have a difficult time understanding what it would be like to live without water. In the United States we take water for granted. Most of us expect nice, clean, pure water when we turn on the tap. Mexico's water resources historically have been known for their poor quality and limited access, but the growth in population and increased pollution coupled with the effects of climate change has escalated the need for improved water management systems. Improved stewardship of water resources in Mexico is critical. In 2005 the National Water Commission reported a 50% drop in the overall water supply in Mexico (Thompson, 2005). This water crisis affects food supply, human health, family social structures, and employment opportunities for all Mexicans either directly or indirectly. The quality of Mexico's future will depend on how water is used and what efforts are made to increase availability of water.

For fourteen year old Santiago this need for water is an everyday part of life. Already out of school for two years, he has to take care of his family because his father is in the United States working illegally like many other men in the village. Santiago's father is only able to send money occasionally. Santiago is the oldest of two sisters and two brothers that are all still going to school but unfortunately like him it is unlikely that they will continue their education past the sixth grade. Santiago wakes up early and helps his mom get his brothers and sisters ready for school and then they begin to care for the crops they raise that are extremely stressed from the unbearable heat and the never-ending drought.

Small farms in rural Mexico

The rural areas are not as advanced as the rest of Mexico. The unpaved roads, subsistence farming and herding, no indoor plumbing, and water gathered from streams or pumped and stored in barrels (Buechler, 2009) create additional hardships on the poor families. Guanajuato is a state in central Mexico. Through the center of it flows the Lerma River, the largest river in Mexico. This area has historically been critical to food production in Mexico (*Britannica*). 80% of the farms in this region are small farms ranging from 2-5 acres. The farmers purchase seeds from the local store to grow corn, onions, broccoli, flowers, strawberries, oats, sorghum, chilies, and tomatoes. The farms are irrigated from the river and its tributaries by using inefficient dirt ditches. The majority of the water is lost in transport to the fields. Farmers in this area are in their mid to late 50's and have no education past the 6th grade (Perez-Espejo, Ibarra, Escobedo- Sagaz, 2011). Mexico claims to have a public education system up to the university level but in Guanajuato the *preparatoria*, or high school, that feeds into the university has 500 seats available and more than a thousand applicants each year (Vikhrest, 2009). This makes education unattainable for rural poor citizens and when the money for education has to be spent to purchase water and food the chance to improve their socioeconomic status is lost.

Many of the men have immigrated to the United States while their wives search for work outside the home to subsidize their small farms. However this job search is often difficult, in Mexico there are not many jobs for women. Additionally the women in Mexico traditionally have less education and are

expected to take care of the family and the cleaning. They spend many hours of the day grinding corn and cooking tortillas over an open flame (Buechler, 2009). The loss of the parent (usually the father) who immigrates to the United States also has a negative impact on the family; when Santiago's father left in search of work it was very hard on his mother at first and negatively impacted her mental health. She has now accepted that she must take more of a masculine role and perform much of the work her husband left behind. Even though she has more freedom and can break away from her culturally defined traditional role, which in the Western and European parts of the world are thought to improve the mental state of women, here in Mexico it has an adverse effect. The sadness and depression women feel comes from missing someone they love, accepting additional responsibilities and then having to deal with losing the freedom they have gained over the time the husband was gone. The conflicting emotions are sometimes hard to resolve. Sometimes this transition in roles may lead to marital violence if the husband is heavy handed (Wilkerson, Yamawaki, Downs, 2009). If income on the farms could improve, support systems within the family structures could be restored.

Mexico's Water Supply

The water scarcity in Mexico is comprised of several different factors that are all interdependent. Water resources in Mexico include lakes, rivers, and aquifers. These resources are being depleted and damaged due to increases in population, pollution, temperature, evaporation rates, and a decrease in rainfall. In Mexico and several other Latin-American countries, no less than 4 million people are drinking water that is contaminated with dangerous levels of arsenic. Arsenic contamination is the result of natural and non-natural causes. Mexico sits on three major tectonic plates which are a source of volcanic activity. The arsenic found in these rock formations contribute to the contamination of underground and surface water. Industrial processes such as mining and smelting are a non-natural source of contamination. Mexico is the world's largest source of silver. The mining process is a major contributor of arsenic into the water supplies. Filtration and treatment centers that require using chemical processes to remove harmful contaminants generate large amounts of unusable wastewater. Without new technology and regulatory policy for industry, Mexico will continue struggling to supply adequate water for its growing population (Camacho, Gutierrez, Alarcon-Herrera, Villalba, Deng, 2011).

The extreme weather patterns experienced in Central America that create intense hurricanes, increased flooding, and unpredictable rainfall also contribute to the chaos of the supply. Mexico has a climate that ranges from tropical to arid but is classified predominately as semi-arid because annual rainfall for over 52% of the territory is less than 500 mm. (*Explorando Mexico*). It is reported that Mexico will see an average rise in temperature of two to three degrees Celsius by 2030 and four to seven degrees by 2090. This increase in temperature will increase the evaporation rates and warmer temperatures will affect the health of the plants and yields produced on the farms (Buechler).

Water for domestic use is extracted from underground aquifers. Mexico's limited ground water supply is being over-extracted as the population continues to increase. In 1960 there were 38 million people in Mexico and in 2010 the population reached 107 million (*World Bank, World Development Indicators*). The amount of rainfall has become inadequate to recharge the aquifers. Only about 5 % of the rainfall actually infiltrates the subsoil. For the poor rural and urban Mexicans the ability to access clean water becomes more and more difficult. Around 11 million Mexicans go without any clean water and only 30% of the water in Mexico is treated in the cities. Purchasing bottled water costs about \$2.38 and minimum wage is around \$4.32/day (*Go Mexico Guide*). To pay several dollars for just a one bottle of water makes life very hard.

The natural resources managed by government and private entities are used in agriculture 77%, industry 10%, and municipal and domestic use 13%, according to The Virtual Center for Water Information (Taylor, 2011). Because agriculture uses over 77% of the country's water, this is the area where changes in practices and policy can have the greatest impact on water conservation. The size and purpose of

farming has transitioned in Mexico since the 1980's. The involvement by the Mexican government in agriculture has diminished greatly since the 1980's. Between 1981 and 1993, government investment in agriculture has diminished by 81.8%. Trade policy has led large farms to become major exporters of many different agriculture products. The small farms are the primary source of food for local consumers. The reduction in production is causing a serious problem for the subsistence farmers (Buechler). For Santiago this creates a major struggle in his family. When the crops do not produce there are no extra vegetables to sell for income and the family is unable to purchase healthy food, water filters, or upgraded water technology to help improve their lives. Santiago and his family are forced to go to the store where they buy cheap food with little nutritional value and is addictive. Santiago's brothers and sisters no longer have a healthy diet and are becoming overweight. Everyone in the village is having the same problems with having no water. They are unable to afford seeds and needed farming supplies and without money therefore they do not have a large variety of healthy foods to choose from.

Recommendations

Recommendations to alleviate the water crisis in Mexico must consider that various solutions are needed for the different regions of Mexico. Multiple strategies must be implemented at different levels of society. International agencies, the Mexican government, private industries, and local communities must all work together to find the unique combination that will be effective for Mexico as a whole in attaining food security through water conservation practices. Mexico has a political structure with the ability to develop and implement action that can change their water crisis. Even though Mexico is considered a developing country, they have an established government called a federal republic. Mexico consists of 31 states and one federal district. The economy is ranked by the International Money Fund as the fourteenth largest in the world. (BBC). Most recently the Mexican government established a 5 year National Water Plan. This plan was implemented in 2007, the Consultative Council on Climate Change and the Intersecretarial Commission on Climate Change provide the strong institutional structure for policy development and implementation but the mechanisms to translate federal policy into state-level implementation are not evident (Pitcock, 2011).

Mexico struggles to meet the financial needs of their country. In order to reduce expensive energy costs, many countries are looking for alternate energy sources. Finding an energy source that can reduce greenhouse gas emissions and provide independence from foreign oil would benefit the country financially as well as improve the conditions that are creating climate change. Mexico is ranked 10th in the world for the greenhouse gas emissions (GHG). The possibility of biofuels to reduce their GHG emissions is one strategy being debated. Evaluating the water requirements needed to produce biofuels must be considered along with the implications on ecological systems when establishing new energy policies (Dale, Lowrance, Mulholland, Robertson, 2010).

Local agriculture communities need training in best management practices and on-going assistance in implementing new technology in order to reduce the amount of water used. The reforestation effort in Mexico must continue; one of the greatest sources of pollution into the surface water is sediment coming from erosion. Financial institutions can assist by providing funding and credit for farmers who need to update their farming and irrigation equipment that increases water efficiency. International agriculture agencies are needed to help provide personnel to educate small farmers and provide native seeds that thrive better in their natural habitats and increase yields. Farmers must adopt management practices that improve and maintain the quality of the soil such as crop rotation, improved tillage and proper application of fertilizers, pesticides and herbicides.

Addressing the water crisis in Mexico also requires a mindset change of the citizens. Mexicans have accepted that limited, expensive, non-potable water is the way it is. Changing a paradigm begins with exposing the youth to a new reality. Ramon Aguirre, director of Mexico City's water department says,

“We need to educate people from when they are children that water is valuable and needs to be used wisely.” Alexandra Pres’ research in capacity building explains:

“As long as this ‘how’ remains a mystery, people will focus on the daily business and get caught up with complexity at an operational level; they will rather fulfill tasks than perform. Improved water resources management might be achieved by fulfilling tasks. An integrated water resources management requires more: it requires social commitment and future-oriented interdisciplinary performance; a conviction that is based on human welfare and thus the change of individual attitudes towards a common one, and it requires a committed leadership that is inclusive rather than exclusive.”

Using a positive, popular public relations promotion to convince the population it is past time to invent a new reality. For example, in the United States there is a campaign to reduce childhood obesity. The National Football League sponsors a Play 60 program that is being implemented in schools across the country. This program supports the school by providing free curriculum, engaging schools in competitions, and uses annual data collection of the physical abilities of students to win time with their favorite NFL team members. A similar campaign using the soccer leagues could be implemented in Mexico with water conservation as its theme. Mexico’s pride and enthusiasm for the national sport and its star athletes could be used to drive home a message of pure, clean water for all of Mexico. The United Nations has the support of athletes worldwide and could play a role in this endeavor for Mexico. Conserving water must be embraced by the Mexican population, wealthy and poor, urban and rural, using a noncontroversial popular vehicle like soccer could inspire the public to adopt a new attitude for a new way of life.

Conclusion

In order to reduce hunger and poverty in half by 2015 to meet the Millennium Development Goals of the United Nations, Mexico must accelerate their efforts to ensure access to adequate clean water. The food security in their country is dependent upon action in this area. A 10% improvement through more efficient irrigation systems and better soil and crop management can have an impact in the availability of water for municipal and domestic uses that will encourage the Mexican citizens that there can be clean water for everyone. Focusing on water conservation in agriculture will increase the supply and reduce the use of water.

The collaboration of international agencies, private organizations, governments, and individuals in providing education, funding, and technical expertise can make a difference. But, before Mexico can reach the next level of success it will take the people’s involvement to make this change. Educating the people on better water management will be the first step of many towards improving the situation. In order to get people on board to make changes it is critical that the action plan consist of short term and long term results for their investments of time, money and action. Being able to see change, even if it is small at first, will cause the proverbial stone to start rolling. One important idea the people of Mexico need to understand is that one million starts with one first. One saved glass of water becomes one liter, one liter becomes one kiloliter. No one should have to wake up every morning or go to bed at night scared of not having enough water to drink the next time they are thirsty.

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