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Mexico, Factor Two: Water Scarcity

## **Improving Water Usage in Mexico's Agriculture**

Our most important resource, that which we think of as infinite and never ending, is drastically being wasted, misused, and polluted. It is present in our everyday lives and affects everything around us, water. It is easy to forget how some people don't have access to instant and clean water by turning on the tap, how some countries depend on water from aquifers and rainfall to boost their economies, how some people rely on the tiny amounts of water they have to grow food for their families plus a little more to earn some money for their hard work. There is no need to go very far to notice these things; one might just travel down to the border country, Mexico, to see such a frightening thing: water shortage. Agriculture employs twenty-three percent of people in Mexico and sixty percent of its produce is exported to the United States, making Mexico the United State's second largest agricultural supplier despite having less arable land than the United States ("Mexico - Agriculture"). The need for water is made greater as the demand for crops increases. This water shortage doesn't only affect the large scale farms in Mexico, but also the poor who farm for their own family. There are some measures already in place in attempts to help or better this situation of water shortage but much could improve.

The size and structure of a typical farm family in Mexico usually depends on their income and socioeconomic status. Like in many different countries, it is shown that women of a lower income have higher fertility rates compared to women with a higher income (Schultz). With that being said, poor families will have upwards of two kids or more while families that are better off will have at the most four children. More children means that more people would help in the farm which benefits the poor who do not have money to employ anyone. The diet in Mexico is often carbohydrate based with protein following behind in order to have enough energy to work; to get the cheapest price people will often buy in bulk staples like corn or beans. Many times people eat junk food instead of a homemade meal because of the availability and low price. Most towns, even the smallest ones, have a convenience store or some other establishment that sells junk food. These bad diets and bad dietary choices often lead to obesity and cardiovascular problems ("Mexican Diet"). If the family is able to, they often eat three big meals a day and any snack along the way when hungry. Education also varies throughout Mexico but most people do not decide to go on to higher education and thus only complete schooling up to high school, some even less than that. Most people go to the compulsory primary school but the rates of enrollment drop in secondary school because most children work or help out their families ("Education"). The students are not very motivated to stay in school often because of the lack of parent involvement -- often due to working -- and lack of encouragement from teachers, who are not paid enough and often have limited resources to teach. Mexico is very broad in terms of healthcare, in some places it is quite excellent while in others it's understaffed, lacking materials, or not following safety procedures (Puig). Despite this disparity, Mexico has recently made universal health care available to every Mexican no matter what socioeconomic status they are in (Feldscher).

The amount of area dedicated to agriculture in Mexico is determined by hectares. One hectare is equal to 10,000 square meters. In the north part, families tend to farm upwards of one hundred hectares while in the south part, families will farm twenty or less hectares (Burton). The crops grown are different according to the state, but in general crops include the following: corn, beans, coffee beans, citrus fruits, tomatoes, avocados, papayas, bananas, grapes, chilies, mango, cucumbers, snap beans, soybeans and several other fruits and vegetables ("Economy and Agriculture"). Some are grown by crop plantations and others are included in long term farming like coffee beans that take about one to three years to produce a

pound if the conditions are right. Often times in agriculture people either choose growing crops or harvesting livestock because of the intensive labor. Most people choose crops because livestock often does not yield enough to provide for a family. A larger scale farm often will implement new seeds, fertilizers, and even new technologies like farming equipment to produce a large yield while a small scale farm cannot afford new and expensive technologies, thus relying on what nature provides them or a cheap alternative. There is plenty of room for both types of farms to improve in order to maximize the yields and make the process more efficient.

Farm families, whether they own a small farm or a large one, have several barriers and adversities to overcome. First, they must improve their diets in order to improve their overall health as most Mexicans are at risk for cardiovascular disease and diabetes due to eating foods high in saturated and trans fat and low fiber or what is referred to as a Westernized diet (“Hispanics”). Another barrier would be people’s lack of education. They prefer to drop out and help out their families, but if the students would finish their entire educational career and study agriculture in college, it would further benefit their family. All of these factors affect employment at a living wage. The barriers that affect agricultural production are many. The biggest offender would be the lack of water due to overpumping the aquifers and little rainfall to replenish them (Dickason). The lack of water affects both big plantations and small family farms as their crops cannot thrive without water. Not only is there a need for water, but people are misusing a lot of it by using irrigation on the highest setting, trying to assure that their own crops get enough water. Another barrier is transportation. Food markets are readily available, especially in more urban cities but the problem lies with rural farmers who need to travel quite a ways to sell and buy products. To sell, they need to have enough crops to be able to make a gain after taking in account gas, time, and effort but on the other hand, they need to have enough money to buy other products they might need like meats or dairy. Another barrier that faces Mexicans is the weather. If it is too hot, no one will want to be out buying and if it is too cold, again, no one will want be out buying things. Usually rainfall comes in heavy bouts so it would also rule out a selling day. Some things are controllable while others cannot be avoided.

Water scarcity is affecting all of Mexico, the poor, the middle class, and the rich alike. Mexico has cities competing for water and people are scrambling to find ways to try and conserve what water they have. The water is distributed unevenly throughout Mexico, with seventy-seven percent going to agriculture, fourteen percent is used for the public, four percent is used for industrial purposes, and finally five percent is used for thermoelectrics (“Water Report”). The lack of water affects agricultural productivity, household income, food availability and quality. All three factors go hand in hand as one thing affects the other which makes water scarcity a real problem. The farmers will plant their seeds and water them but the amount of water is lacking. Thus a choice must be made between watering them less every day or perhaps every couple of days or not at all; some crops may flourish while others will die out. This will undoubtedly decrease yield which means that there is less food and the quality may not be the best it could have been. With decreased amount and quality of food, the farmers lose out on money that would have been used to support their family. The effects of water shortage expand well beyond the farming industry. Water scarcity affects the amount of healthy, clean, and potable water the country has to live on. Some people do not have regular access to water and have to decide between drinking water, showering, or doing other daily housework. Others have to choose between which one of their children gets more or less water depending on the labor they perform. Some people are pushed to the extremes and they are forced to drink water that is unsuitable for them and their kids, riddled with invisible pathogens that cause cholera or other illnesses that can be life threatening if not treated. Even bullying can surface from not having enough water, as some children cannot afford to wash their clothes or themselves as often as others. Kids may make fun of them for coming to school in such conditions which could cause a plethora of mental issues such as depression, anxiety, or even just apathy (“Effects of Bullying”).

Water scarcity affects all communities and cities in Mexico, from the youngest citizen to the oldest. The current condition of water scarcity is critical, as the aquifers are being pumped dry and some cities are

even competing over the limited water supply. Some cities are taking drastic measures, pumping from contaminated aquifers from a mile deep. This will cost millions of dollars and it would only give some of the city water for a while (“Managing Water Shortages”). The water scarcity is only worsening and declining as Mexico’s government is searching for all types of methods to make sure that all citizens have access to water, which isn’t an easy task. The government is resorting to drilling into deep aquifers and paying a higher price for the water the people need. Improving the situation Mexico is in would allow families to have water for themselves and would prevent citizens from having to buy bottled water for drinking. Buying water bottles can be costly and also add unnecessary pollution.

Increasing Mexico’s water supply would also boost the yields of crops that can be used to feed families or to boost the nation’s economy by exporting produce to the U.S. and other nations as well. While water scarcity is the main focus, there are several factors that play into the agricultural crisis and decrease the quality and the amount of crops. Pollution is a huge culprit in the water system, many creeks and rivers can be seen littered with human waste or sometimes even animal waste. Nonpoint source pollution is also a major contributor in bodies of water. The dry climate doesn’t allow for regular rainfall but rather when infrequent heavy rainfall occurs this leads to soil erosion and runoff, making the soil lose nutrients. The increase in the population calls for a greater demand of water and food, two things that can’t be provided if the amount of water available keeps declining.

One of the first things that should be accomplished should be to change the method of irrigation. Instead of using surface, or flood irrigation --which is only forty to fifty percent effective-- people should switch to micro-irrigation because it is more efficient and less wasteful. Micro-irrigation, also called drip irrigation, lets out 0.5 gallons of water per minute which saves several gallons of water. It also benefits the farmer because the amount of evaporation as well as wind and soil erosion is decreased. (“Water Conservation”). However, this method would only be recommended for farmers who have more money than average as micro-irrigation is expensive to install. In turn, subsistence farmers could make their own similar system using cheaper materials called affordable micro-irrigation techniques or otherwise known as AMIT. AMIT was developed especially for poorer areas of the world such as the Indian continent as well as various places in Africa. A water tank, that can be made out of different materials such as a plastic barrel, iron drum, or even a man made container, placed a couple of inches above the crops is attached to spaghetti tubing with various small holes that line up around the crops. Once the system is constructed, gravity will be do the rest of the work and water the crops with no added energy or effort (“Low”). Farmers should begin using no till farming, as this conservation method is not only easy and less labor intensive, but also improves root structure and water holding capabilities (“Nature’s Value”). Using crop rotation should also be considered as some crops like corn drain the soil of nutrients year after year and are actually more susceptible to pests and disease. When rotating crops, different nutrients are allowed to enter the ground and break away from the strict monoculture (“Nature’s Value”). Little things like having a irrigation schedule can reduce the amount of water used as some crops do not need to be constantly watered and could go a little longer without moisture (“Conservation Practice”). To encourage farmers to use these methods, it would be recommended that the government put in place incentives to use new technologies. One of the practices already being used in Mexico, is using rain water or even waste water for crops. While this is a good practice, it could be better and more useful with big water storage bins or even clay covered ponds for heavy rain water. Having buckets under roofs and other structures will collect various inches of water. The wastewater can not be too contaminated or it could kill the crops, but it is a good way of recycling water. The community can help by each collecting rain and giving it to the farmers or having a community water storage tank. Isla Urbana, a non-government organization, specializes in affordable cisterns that are being placed in Mexico City, Mexico. This provides a way to both manage the flooding during storm season and provide families with water that is desperately needed. The education, training, and subsidy models are all taken care of by the NGO directly and have collected 29,300,000 liters of rainwater so far. The best part is that the price of \$350 is fairly reasonable for what the citizens will benefit from plus installation only takes a day (Gammon).

The government could also help farmers by offering them crop protection and attempt to renegotiate NAFTA, also known as North American Free Trade. This deal removes the tariffs of many products when importing and exporting products within North America. NAFTA heavily favors the U.S. as the country can produce at least the minimum of required crops while Mexico was below average in corn production and was encouraged to grow fruits and vegetables that were either counter-seasonal or tropical. In the current agreement, those who live in an impoverished or indigenous area were not taken into account. The policy forced poorer farmers to move as the prices for their crops lowered substantially as well as often left them without a job. Mexico used to spend 1.8 billion dollars on food imports but that amount has increased dramatically to 24 billion dollars, this means that there is less local food being grown and used by citizens (Carlsen).

The aquifers' resources have been exhausted and it has caused a significant problem in Mexico. There are different ways the country could deal with this problem beyond encouraging trade deals and good farming practices. Rather than attempting expensive methods of retrieving water such as with salination that can cost upwards of \$2000 per acre foot, recharging the aquifers would be more effective. In the present times, several urban structures such as roads, buildings, and other types of manmade objects make it hard for water to soak into the ground. If water cannot reach the aquifer, then it cannot recharge or in other words replenish the water. However there are ways to combat against urban development although artificially, such as adding recharge ponds or injection wells (Choy). Recharge ponds allow for water to sit and percolate into the soil until it reaches the aquifer; this method is slower but it requires little to no effort. However, a few things to consider is the location of the basin. The soil cannot be too high in clay content or it cannot be compacted as this affects the speed of percolation. The other option, injection wells, are a more active form of recharge that takes significantly less time to use but must have some regulations to operate. Drilling into the ground makes it plausible for gases to escape if one is not careful. Both options would be a good start in replenishing the aquifer (Rydman).

The typical farmer family can rally for support of the government and demand for classes that teach smart and innovative ways to produce crops. The family can implement the techniques on their own farms and spread the benefits by word of mouth; undoubtedly the best way to spread a message. Or one could join in on the movement often referred to *Campesino a Campesino*, or farmer to farmer in English. Each farmer gives advice as well as tips and techniques for other farmers around mesoamerica (Holt-Giménez). Farming families should let new farmers tour their fields and look at the methods they utilized in order to get a good idea for their own fields, maybe even having more community outreach and letting school children come to learn more about agriculture and why it is important. Another way for the community to become involved is to create a community garden in which people can have twenty-four hour access to grow their crops. This creates an opportunity to exchange ideas and planting methods while generating an interest in agriculture in general. To reach out to the younger members of the community, gardens could be established near the school where children could be taught about different crops and how proper use of water goes a long way. The children could then harvest the crops to use for a healthy meal. School-based gardens would have a double benefit as they help with the problem of obesity and it keeps children out of street-related activities ("Editorial"). Having community outreach is a good way to have a thriving society in which all the members receive benefits.

When the water scarcity crisis in Mexico ends, there will be many improvements such as health, education, and even jobs. Many factories could open up to build materials for micro-irrigation that could employ many people. The micro-irrigation system itself helps manage the water in a manner that is beneficial for the crops and for the community. Educating people with community farms, especially in their younger years will often help cultivate a genuine interest in agriculture and farm techniques to increase yields while decreasing water usage. With increased yields comes accessible and affordable food which means that families will be less inclined to buy junk food and will choose healthier options to feed their family. Fruits, vegetables, and wheats grown in the country are more nutritious and even tastier than

the prepackaged meals, this will reduce cardiovascular and diabetic problems in the future. Improvement in food quality will make school children more alert and ready to learn, as well as grow and develop like they should (Norman). Finally, more farms means that there will be more jobs throughout Mexico, providing employment for thousands and boosting the economy. People who have money to spend on their family's needs will spend it, thus circulating money in the economy.

Water scarcity affects many aspects of life, as we rely upon water for our sole survival on this planet. The lack of water availability in one part of the world, affects the entire globe from the major countries like the U.S. and China to even the smallest country like Maldives or the Vatican City. Food security is compromised if there is not enough water to produce the crops needed by the billions of people on Earth, and it will present a larger problem in the future when our population increases. Together we will think of new technologies and new strategies to combat and defeat world hunger. Together we shall maintain a global food security for ourselves, for our children, and for generations to come.

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