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Peru, Factor 2: Water Scarcity

Not a Drop to Drink In Peru

Many people today take water for granted. It rains often enough that we rarely worry about our crops drying up or our wells running dry. However, in much of the world, even parts of our own country, water does not come so easily. It must be pumped out of rapidly shrinking aquifers or diverted from lakes and rivers. This can make it quite difficult for people to prevent disease, stay hydrated, and grow crops. In all countries and climates, water is essential to life.

The harsh environment of Peru has long presented challenges to the inhabitants. The coastal desert, which contains 70% of the population, receives very little rainfall (Alegría). It is, however, very humid in the coastal desert, and many of the plants have adapted to gaining water from the air rather than their roots. Most water is derived from the multiple rivers that flow from the Andean highlands ("Peru's Geography"). Although fruits and vegetables were produced in abundance here a millenium ago, the recent melting of the glaciers that feed the rivers, the production of cash crops that deplete the soil and water resources, the destruction of ancient canals, and the heavy use of water in upstream mining operations have caused many problems with water shortage in the area ("Asparagus").

Peru is a very urban country. Around 77% of the population lives in cities, most of which are found on the coast (CIA World Factbook). The average family size is five people, with larger groups in urban settings and smaller families in rural areas ("Family Life"). Peruvian families typically bear some resemblance to traditional Western families, consisting of a mother, a father, and their children. However, it is quite common, and in many cases expected, for men to have more than one wife, and to preside over multiple households. In rural areas, extended families form social orders knows as ayllus, which contain their own hierarchies and dictate certain areas of life, including how farmland is divided.

The very diverse climate has caused great variations in diet, but most citizens regularly consume potatoes, rice, beans, grains, and seafood ("Food In Every Country"). Interestingly, the people of the Andean highlands are known for establishing small, dispersed plots of land at different elevations to take advantage of the diversity of crops that can be grown. This has allowed them to have greater variation in their diets and more stable food sources when disaster strikes ("New Agriculturist").

Education is required to be free and equal for all students ages 6 to 16. Learning is very highly valued among Peruvians. This is especially true among those of indigenous ancestry, because since the Spanish conquest, it has been viewed as the best tool for integrating oneself into the culture so that they might become more successful and accepted in society. Secondary schools are required to exist in every regional capital, so that everyone has some chance of higher learning ("Educational System").

Medical care in this South American nation has improved over the last few decades, but for many, it is still out of reach. Around one in three Peruvians, mostly those who live in rural areas, do not have access to basic health services (Goldberg). Consequently, water- and food-borne illnesses are very common in Peru, especially bacterial diarrhea, typhoid fever, and Hepatitis A. This is due to the lack of adequate sanitation, especially in rural areas, where only 44.8% of people have access to improved sanitation facilities (CIA World Factbook).

Over 70% of the farms in Peru are less than 12 acres in size. Most farmers grow the staple crop of their Inca ancestors, the potato. They also produce rice, corn, beans, and some grains, especially amaranth and,

at higher altitudes, quinoa ("Family Life"). Some of the most significant cash crops produced include coffee and asparagus, although asparagus has been known to deplete the already sparse water sources ("Asparagus"). Many of the agricultural practices developed by the ancient inhabitants here have been lost due to Spanish conquest and epidemics of smallpox. However, some still survive, including use of the foot plow and intercropping to protect against erosion and diseases ("New Agriculturist").

Employment is often hard to come by for Peruvian citizens due to the poor economy. Many have migrated from their rural homes into urban environments to find work, leaving the countryside with a labor shortage, and the cities overcrowded with ramshackle squatter settlements, where disease is common due to lack of adequate sanitation (Glugale et al.). The culture of Latin America emphasizes the employment of servants to show social class and wealth, so young girls typically find work in a middle- to upper-class household. Unfortunately, this has often led to cases of abuse, so the government of Peru recently enacted legislation to regulate the industry and protect servants. Men in the cities may travel long ways to construction sites, where they walk the steel frames with little or no protective equipment. The need for employment is so high that most buildings in Lima and other urban centers are still erected almost entirely with man-powered labor rather than machines ("Family Life").

Nutrition in Peru is often quite lacking due to the fact that only 2.85 percent of the land is usable for crop production ("New Agriculturist"). As of 2012, 18.4 percent of children suffered from stunted growth due to malnutrition ("NLiS").

The water scarcity problem makes the present state of malnutrition in Peru even worse. The necessity of using polluted water in the absence of pure water causes many cases of bacterial diarrhea, hepatitis A, and other water-borne diseases. Estimates show that there are between 18 and 22 million cases of diarrheal illness in Peru annually (Glugale et al.). This means that nearly 70 percent of the population experiences such symptoms annually. Almost all cases of diarrhea are treatable with nutrient supplements and that precious resource: fresh, clean water. Sadly, malnutrition and diarrhea act together in a torturous cycle: people who are not adequately nourished are more likely to suffer from diarrhea due to weakened immune systems, while diarrhea causes loss of nutrients, increasing the severity of malnutrition. In fact, intestinal diseases are the leading cause of malnutrition in children under 5 years of age ("Diarrhoeal Disease").

The lack of a reliable water supply also reduces the amount of food a family can purchase. Due to poor infrastructure, about 59% of Lima residents must buy almost all of their water from pumping trucks. The trucks often charge high prices for their services (Glugale et. al). Around one-third of Lima citizens must spend anywhere from 40 to 70 percent of their income on water from vendors. Those who do not pay for this often retrieve water from wells, which in Lima are unreliable and often polluted with bacteria or chemicals used in upstream mines (Lubovich). Of course, this leaves them with less money to buy adequate food for their families, which contributes to the current state of malnutrition.

The present water shortage in Peru is not especially severe when compared to other countries, such as Ethiopia, where only 38% of people have access to water ("Water Supply"). However, this nation has one of the lowest rates of sanitation and access to water supply in Latin America (Glugale et al.). This is a problem that is not caused by a complete lack of water, but rather poor management of water resources. When the territory of Peru is seen as a whole, it should have more than enough water for its citizens. In fact, this South American country has the seventeenth largest water reserves in the world. However, as mentioned previously, 70% of inhabitants of Peru live in cities in the coastal desert, which contains only about 2% of total water resources in Peru, making it quite difficult for the majority of Peruvians to have access to clean water (Alegría).

This lack of water is causing the environment to be steadily polluted. Untreated human waste is transported away and continually dumped into rivers, eventually flowing into the Pacific Ocean. The

trickle of water from the Andes that makes it into the urban centers is often contaminated with heavy metals and toxic substances such as lead, mercury, and arsenic due to mining activities upstream (Glugale et al.).

Sadly, those who are hit hardest by the water shortage is a large group that already has many struggles: the urban poor. This is so because these families often live in unimproved squatter settlements at the outskirts of cities, where they are given very little government support and live in makeshift houses constructed from wood, scrap metal, and anything else that might be available to them ("Family Life"). Not only are they not connected to the main sewer systems and water pipelines, but they rarely have enough money to buy clean water from the cistern trucks that deliver this life-giving nutrient. According to a study conducted by the World Bank via Liebenthal and Salvemini, the poor of Peru are affected by diseases such as cholera, bacterial diarrhea, and intestinal worms three times as often as those who are more fortunate.

Overall, it seems likely that the situation is worsening in Peru. The population is growing, which will lead to an increased demand for water, and the melting of the glaciers that feed the rivers during the dry season will greatly reduce the supply when it is most needed. In the Andes mountains, the great glacier known as Quelccaya, the largest of its kind to exist in the tropics, is now shrinking by as much as 200 feet every year (Liebenthal, Salvemini). This is a major problem for the people of Peru with regards to water, and it will only continue to worsen as the global temperature increases. However, there is hope, as in 2013, the government of Peru made an official goal to attain 100 percent treatment of all wastewater in Lima by 2015. They have begun construction of two major treatment plants to achieve this goal: La Chira and Taboada (Quigley).

Improving the water scarcity situation in Peru would make it much easier for Peruvians to use their income, earn more money, and feed their families. The decreased incidence of disease would lessen the malnutrition problem; if they spent less on getting clean water, then they would have more to spend on other necessities, such as food, or a safer home, or medicine. If less water were needed in the cities, there would be more available for agriculture, which would also improve the economy and state of nutrition. This increase in food production would decrease food prices for the people, and allow farmers to make more money by exporting their produce to other countries for sale. A decrease in mortality and productivity loss due to pollution and disease would increase the amount of labor available, which would be very helpful in the Andes and the highlands now that many people have migrated to the cities to earn more money for their families. Education would also benefit if students were not ill so often, and if they were better nourished, which would then make it easier for citizens to find well-paying jobs and escape from the iron grip of poverty. The peace of mind and sense of community would improve if water resources were less scarce, due to the decrease in both competition for water and the uncertainty of whether there would be enough later. Such a solution could even help preserve the environment, as less need of transporting water over long distances would decrease vehicle emissions, slowing down global warming and reducing acid rain. It would also lead to less pollution of the rich estuaries and fisheries on the west coast, and a more hospitable environment for fish, wildlife, and flora that depend on the water from the glacial melt each year to thrive. Most of all, it would give an advantage to those are currently most disadvantaged by this situation: the poor city-dwellers of the great metropolises of Peru.

There are many causes for this water stress, and just as many solutions. One such improvement that could be made would decrease the need of water to dispose of wastes while increasing the availability of nutrients for agriculture. This is the composting of human excrement. Although the typical Western idea of sanitation involves flushing urine and feces into water to be later treated with chemicals and buried in restricted landfills, this is not the best way, nor is it feasible for nations with scarce water resources. This is where composting has the advantage. It requires much less water input, it does not involve large,

expensive facilities and constant input of chlorine to sanitize it, and it returns nutrients to the natural cycle that they would otherwise remain a part of (Jenkins).

Sanitization of the waste is achieved by composting it using thermophilic methods. This means that it is layered, properly aerated, and the ratio of carbon to nitrogen is fixed at around 30:1. By doing so, it creates an environment favorable for thermophilic, or heat-loving, organisms, which eliminate microscopic competition mainly by increasing the surrounding temperature to a point where most other organisms, including pathogenic organisms, cannot survive. These bacteria are capable of surviving at extreme temperatures, some even higher than the boiling point of water (Jenkins). However, the temperature at which pathogenic organisms are killed is a much lower 130 degrees Fahrenheit (Savonen). If proper procedures for composting are followed, then human excrement can be rendered just as safe as any other animal manure.

Composting rather than sending waste downstream would also aid agriculture in Peru because it would keep the nutrients that we use available in the nutrient cycle. This means that plants could take up the digested forms of all the nutrients that they do not permanently store, and turn them back into a usable form for human consumption, the way that nature has always worked. In turn, that would mean less need of added fertilizers, along with the potential for farmers in Peru to market their crops as being sustainably and organically grown, giving them a higher value in foreign markets. Both of these would support the economic development of the nation.

A major part of the pollution and public health problem could be solved this way, as well. If waste were kept away from water and composted to destroy pathogenic organisms, then it would no longer present such a danger to human health, nor would it pollute the environment. This would put much less stress on the aquatic environment and eliminate the waste that would otherwise flow into the ocean and expand the dead zone in the Pacific.

Of course, implementing this solution would require many pieces to be put together. This would include teaching each family to compost their own waste or building community facilities so that the excrement from any one small area could be taken to a central location where a few trained operators would oversee the entire process. Legislation would also have to be enacted regarding compost temperatures, retention time, and monitoring in order to ensure the safety of the final product; a certification system could also be developed if the option of using municipal waste sites were chosen. Some kind of transportation system would be required in and around the major cities so that the finished compost could be taken to farmland where it would be used for growing crops.

This solution would directly help the United Nations achieve the Millenium Development Goals of combating disease, reducing child mortality, and ensuring environmental sustainability. It would do this by significantly reducing the rates of cholera and other water-borne diseases in Peru, which would especially help children to have a better chance of survival because most fatalities from such diseases occur in children. This would sustain the environment because it would reduce the amount of fossil fuels burned to transport water and immensely decrease the amount of pollution entering the rivers and Pacific Ocean.

Another important part of the solution would be to reduce agricultural water consumption. This could be achieved by improving the efficiency of irrigation systems so that they are automated to decrease overuse. It would also help if canals and waterways were dug in such locations so as to reduce the evaporation that occurs. A major step in the right would direction would be to diminish and optimize the production of water-guzzling crops, such as asparagus, and replace them with equally nutritious native crops, such as potatoes, amaranth, and the many fruits that are indigenous to the Andes and Peru.

Some organizations already have projects underway to help improve water security in Peru. The United States Agency for International Development is currently collaborating with the Peruvian government to educate rural citizens about better water management practices, rebuild the ancient Incan canals that have been destroyed, and minimize the amount of irrigation needed for producing food. This could be adapted to teach them about composting to reduce water use and pollution, as well. This undertaking is projected to be fully-funded by the year 2017 ("Securing").

Other organizations could get involved and become instrumental in the implementation of these solutions. The World Bank has the resources to improve the water system in Peru. Although the Peruvian government does not have a great deal of money, the Bank could loan them enough to construct composting facilities and educate its citizens on the process. The money saved by the reduced mortality, increased productivity, better access to water, and the reduction in poverty would help the country to pay back the loan. The United Nations is still attempting to increase global access to improved sanitation facilities, and helping even just the people of Lima use their waste properly would take them 6 million humans closer to this goal (Czarnecki). This could be done by sending teams to the urban areas and into the countryside to help them construct the facilities needed and teach the people how to safely and effectively turn their waste into rich humus. The construction would be quite easy in the urban areas, as there is a great abundance of labor there, but with recent migrations into the cities, the rural populations would likely need extra manpower or more time scheduled for construction in order to complete the task. It is very important that the buildings be constructed with the privacy of women in girls in mind, and accommodations be made for young children, who are smaller and would be more willing to use it if it has better lighting, as many are afraid of the dark. The individual communities should also be asked about what they want from a sanitation facility, as the World Bank learned on their last attempt to improve water quality in the country (The World Bank). This is very important, as without community support, the facilities may as well not exist at all.

In conclusion, the water resources of Peru must be preserved now, in this generation, if they are to remain for future generations. The amount of water available to Peruvians will decrease within the next decades, and only by learning to make do with less and find more sources of it will the people of this diverse nation be able to mitigate the effects of the impending climate change. The composting of human excrement is a foreign idea to most people of our nation and to Peruvians, as well. However, it is a safe solution that is both economically and socially feasible for Peru. And perhaps from this struggle, other nations of the world, including our own, will learn a lesson from Peru and find new ways to become sustainable now, when we have the choice, rather than later, when disaster is already upon us.

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