

John O'Brien  
Theodore Roosevelt High School  
Des Moines, IA  
Pakistan, Factor 2

## An Ancient Land With a Modern Problem

In the Indus Valley lies a civilization that predates the compass. A civilization that has been conquered, traded, and fought over for millennia. Wars, trade routes, and years of people using the land have left their marks on this sacrosanct land. Presently this esteemed land is known as Pakistan. In recent times this civilization has found itself in the midst of a region rampant with rebels, terrorist organizations, and religious conflict. These dreadful and destabilizing forces tinker with a nation of 193,238,868 peaceful people<sup>15</sup>. While these human-induced burdens ravage the region there is a more potent and severe crisis present. Pakistan's water resources are deteriorating due to poor farming practices. Farmers in rural Pakistan must flood their fields via wells, rivers, and streams in order to get their plants the proper amount of water. The amount of water that actually is absorbed by the plant is so small that the farmers end up with much of the water wasted. Without immediate action, Pakistan, a land that has withstood thousands of years of agriculture, could come grinding to a halt leaving the people with no food or water. In order to combat water scarcity and prevent further desertification, the farmers, the government, and the people of Pakistan must: invest in environmental education so future generations do not further damage their ecosystem, adopt more sustainable irrigation practices, embrace the advancement of crops resistant to arid conditions, and must preserve the fertile land they enjoy in order to stabilize the country, and the region's, food and water security crisis.

In order to understand Pakistan's problems, we must first understand Pakistan as whole. With a population of a little under 200 million people, and an area of about 308 thousand square miles, the country dates back as far as 5000 years. It is situated on the northeastern part of the Arabian Sea and just northwest of India. Given its geography and age, Islam is the primary religion of which 96% of the nation's people belong. Also given its geography, Pakistan has few natural resources other than natural gas. The nation relies heavily on agriculture, and textiles. Pakistan has been forced to expand into other areas such as pharmaceuticals because of a large young population; 56% of people are under the age of 25 and the median age is 22. Educating these young people is difficult given the average child only receives seven years of schooling. Families are usually forced to take their kids out of school. On average a family will consist of six or seven people, with only 36% of them living in urban areas. Pakistan is still a country of massive cities though, having nine cities with over one million people<sup>15</sup>. When it comes to agriculture Pakistan's commonly produced items are cotton, wheat, rice, produce, and beef. All of this information on a very complex nation will help us provide a solution to Pakistan's water security issues. Because of the nature of water security the solution will be multi-faceted and imperfect.

Undoubtedly, Pakistan is a country of development, growth, and youth. With more than half of all citizens under the age of 25, a food crisis could not be looming at any worse time<sup>15</sup>. Unfortunately, Pakistan's future leaders are ill prepared when it comes to agriculture and environmental science. The average child in Pakistan will likely be forced to leave school as early as the American equivalent of 6<sup>th</sup> grade<sup>15</sup>. While the wealthier, urban families will likely keep their children in school longer, the vast difference in wealth between urban and rural means children in more remote areas are apt to receive even less formal education than the national average. Economics and geography are not the only barriers between Pakistani youth and a productive education. Islam, the religion in which over 95% of Pakistanis identify themselves as, is often misconstrued in the rural parts of the country. In mainstream Muslim culture, education for all is encouraged, but this is rarely the case for young girls in extremely conservative parts of the country<sup>8</sup>. In certain areas the female literacy rate drops into the single digits. With half the population of rural areas deprived of education, no amount of government intervention or

public awareness of poor farming practices can ever be truly applied. If the future thinkers and doers of Pakistan do not receive the skills necessary in order to comprehend the effects of their inefficient water usage, their problems will continue to worsen.

Once education has become more readily available Pakistan must commit to teaching applicable skills to children based on where they live and what likely outcomes are foreseen. For example, a young rural boy in the Sindh province, where agriculture is one of the main portions of the economy, an education about land use, basic environmental science, and farming practices would be more valuable if he were not likely to complete a secondary education so that he can effectively help his farm, his family, and his community. The time spent in schools needs to be maximized so that he learns something he can take out of the classroom and immediately impact the world around him. This young boy can effectively be a figure of positive change even if he finishes halfway through middle school. While this approach cannot be applied in all regions of Pakistan, it can add value to the few years of education struggling rural children are given.

An education for the future of Pakistan is vital for a successful agricultural output in the years to come. This means farmers must change, advance, and modify their practices so no resource is wasted and every opportunity sought out. This philosophy applies directly to the area of water management. Mason Inman, in an article for National Geographic on recent flooding in Pakistan, explains where Pakistan's water problems have stemmed from, "[The] British started to build a system of canals and small dams for diverting water onto fields, when Pakistan was part of their Indian colony"<sup>5</sup>. Each canal would lead to an area where it would be split into canals even further until each piece of farmland had its own supply of water. With this water farmers simply flood their field all at once creating an area similar to a rice paddy. The farmers then tend to their crops, as needed, letting most of the water evaporate into the air, with only a fraction of it going directly to the plant. Not only is water wasted, the amount of water in the field can be harmful to crops. Over watering can produce conditions excellent for growing bacteria and diseases, attracting harmful insects, and can also hinder root system development ultimately growing inadequate food for a family table<sup>3</sup>.

To counteract the inefficient practice of flood irrigation takes understanding through education, and a change of procedure. The new procedure is foolproof, already developed, and widely used. Many at home gardeners throughout the developed world are already very familiar with the stress free system of drip irrigation. Drip irrigation takes the same water source, but requires less of it because the water is directly delivered to the plant. A drip irrigation system might be set up so that a canal, or well, is drawn from, then the water is maneuvered through a hose and released at each plant location via hole or spout in the side of the hose. To stop the process of water delivery the hose is disconnect from the water source and set aside. There is one problem unfortunately for this system to work in rural Pakistan. They have no electricity to pump water through a hose and it is too laborious for a person to do it manually for a large piece of land. They also do not have a public water system that would provide water pressure. Lucky for Pakistan, there is a company that has engineered a device specifically for this reason, Micro Drip<sup>10</sup>.

Micro Drip has developed a system aimed at poor, rural farmers with the goal of providing cheap irrigation for maximum yield and with minimal wasted water. Originally started with money from the Thardeep Rural Development Program (TRDP) and the Acumen Fund, Micro Drip has been in operation since 2007. Their premise is simple, pay the cost based on the size of the land being covered, and the farmer will be able to use the system year after year. Overtime the farmer will save money, water, and in fact earn more money because of the increased yield and quality of his/her crop. Along with their simple premise comes a simple system consisting of four elements. First is a water tank that is kept off the ground at a height of 2 meters so gravity will supply the pressure. The tank is no bigger than 10 gallons for the average field. Next is a flexible pipeline connecting to the water tank called the "Sub-Main". This pipe would run down the center of the field and is capped at one end and comes with a control valve.

Attached to the “Sub-Main” are the “Laterals”, a series of thinner long tubing that run parallel to one another. Connected to those are “Emitters” that feed the water directly to the plant in drips. The Micro Drip system is remarkably simple and effective. Water savings can be anywhere from 50-75%, total input costs can decrease by 30-60%, and product yield can be raised by 10-50%. A hidden benefit of the drip irrigation system is that less pesticide and herbicide will be used because there is no area in which water is available for diseases and weeds to grow. Now with productive, profitable crops that depend less on whatever water source that is used (ground water, canals, rain water) farmers can ensure their family is well fed and well supported financially<sup>10</sup>.

Man’s creative intelligence will be tested greatly as global climate change, and environmental tribulations increase. This can easily be observed in agriculture with genetically modified and hybrid crops. As extreme weather events become more frequent and intense our food supply must be able to handle the adverse conditions – within reason of course. When it comes to Pakistan drought will be a devastating blow agriculturally, with ripple effects in almost every corner of their economy. Pakistan’s most recent drought was from 1998-2002 in which some regions did not see a single drop of rain for almost 5 years, and an estimated two million animals were killed due to the lack of water and vegetation. This is the type of event Pakistan must learn to cope with, survive through, and learn from.

In a drought like the one previously mentioned there is no doubt that agricultural production will be damaged significantly. Pakistan must still be able to earn maximum yield in these times of severe drought though. The easiest way to achieve this feat is by planting genetically modified or hybrid crops. Recently Monsanto started testing their Genuity DroughtGard<sup>TM</sup> Hybrid corn in the great plains of the U.S., in which many Iowans can attest is experiencing significant drought. Monsanto says the new hybrid aims to, “Enhance yield potential when water is limited.” In 2012 it was put to the test on 250 large-scale farms across the plains. As expected the yield increased an average of 5 bushels per acre, more than the current drought resistant hybrid. Advancement and competition between companies across the globe for a more hardy, sustainable hybrid will benefit all farmers over time. And even though poor rural farmers may not have access to any technology like this, as it becomes more and more common, companies in the region – and maybe even Pakistan itself – will form. These companies know that if they sell a quality product to the farmers it will benefit the region as a whole, through consistent, healthy crops.

The weight of all the environmental problems Pakistan faces can, and will, be relieved. The quicker it is relieved depends on the amount of effort, money, time put forth. Included in this push should be overarching policies of land preservation. After all, if Pakistan cannot keep its fertile land, all of the science behind the crops, water saving, and education will be useless. To prevent futile effort Pakistan’s policies must protect the land from degradation of dry lands, also known as desertification.

Pakistan will have to responsibly control a myriad of problems linked to desertification. Of main concern for the nation are urbanization, overgrazing, and deforestation. In the last 50 years the urbanization rate has grown almost 15%. While globally this is not an alarming number, in Pakistan it is. In 2010 researchers from China and Pakistan reported that areas of industry are using up valuable fertile land rather than the less fertile, already dry areas, simply because that is where a majority of the people reside. In this process they are also ripping the area of any vegetation. Secondly, overgrazing fertile, rural land has attributed to desertification in the last 50 years. Since much of the land in Pakistan is relatively dry, if an area becomes overgrazed and doesn’t receive enough rainfall it can become virtually useless for a period of time until vegetation returns. During this dormant period wind and rain can blow and wash the topsoil away leaving the area further deteriorated. Lastly, and maybe most importantly, is deforestation. This cause of desertification is critical because Pakistan is already a country with few forests and minimal tree cover. Of Pakistan’s more than 300,000 square miles of land only 3.77% is considered forest<sup>1</sup>. To put that in perspective, roughly one third of U.S. land is considered forest. For a population of nearly half the size of the U.S. only having one tenth as much wooded area is not sustainable. The trees have value in

that they hold topsoil steady, and mitigate erosion. Understandably, Pakistan's climate cannot support as much tree cover, but at the very least they must not destroy what little tree cover they have left. Currently forested area is being diminished at a rate of 3.1% per year. Pakistan has made steps forward in this area though. With goals set by the United Nations, Pakistan committed to increasing forest cover to 6% by the year 2015<sup>1</sup>. Little by little these measures will pay off.

In order to combat water scarcity and prevent further desertification, the farmers, the government, and the people of Pakistan must: invest in environmental education so future generations do not further damage their ecosystem, adopt more sustainable irrigation practices, embrace the advancement of crops resistant to arid conditions, and must preserve the fertile land they enjoy in order to stabilize the Pakistan's, and the region's, food and water security crisis. The multi-faceted approach presented, along with cooperation from the government and the people involved undoubtedly would improve, if not fix, the issue of water security. If solutions like this are not developed and implemented Pakistan will face a rude, and abrupt, awakening of epic proportions. One of the great civilizations in human history should never get close to that point. Now is the time for the budding nation to show itself, and the world, how sustainable water management is done. Hopefully, by the time Pakistan's youth are able to look at their own children, or grandchildren, they can feel that they left their land in better condition for them.

## Works Cited

1. Anjum, Shakeel A., Long-chang Wang, Lan-lan Xue, Muhammad F. Saleem, Guo-Xin Wang, and Cong-ming Zou. "Desertification in Pakistan: Causes, Impacts and Management." *Isfae.org*. WFL Publisher, 13 Apr. 2010. Web. <<http://www.isfae.org/scientificjournal/2010/issue2/pdf/environment/e65.pdf>>.
2. "Desertification in Pakistan." *The Express Tribune Desertification in Pakistan Comments*. N.p., 20 June 2011. Web. Mar. 2013. <<http://tribune.com.pk/story/192712/desertification-in-pakistan/>>.
3. "GrowGuides Watering and Irrigation." *GrowVeg.com*. Growing Interactive Ltd, n.d. Web. <<http://www.growveg.com/growguides/watering-and-irrigation.aspx>>.
4. Hardee, Karen, and Elizabeth Leahy. "Population, Fertility and Family Planning in Pakistan: A Program in Stagnation." *Populationaction.org*. N.p., Oct. 2008. Web. <<http://populationaction.org/wp-content/uploads/2012/01/pakistan.pdf>>.
5. Inman / National Geographic, Mason. "Pakistan Flooding Because of Farms?" *Nationalgeographic.com*. N.p., 16 Aug. 2010. Web. <<http://news.nationalgeographic.com/news/2010/07/100716-pakistan-flood-farms-river-management-irrigation/>>.
6. Kamal, Simi. "Use of Water for Agriculture in Pakistan: Experiences and Challenges." Lecture. Conference on The Future of Water for Food. University of Nebraska, Lincoln. 3 May 2009. *Conference on The Future of Water for Food*. Web. <<http://research.unl.edu/events/futureofwater/ppt/SKNebraska.pdf>>.
7. Lahiri-Dutt / Australian National University, Kuntala, Dr. "Special Essay: Pakistan Floods." *Global Water Forum*. N.p., 6 Sept. 2010. Web. Mar. 2013. <<http://www.globalwaterforum.org/2010/09/06/special-essay-pakistan-floods/>>.
8. Latif / Pakistan Press International Reports, Aamir. "Alarming Situation Of Education In Pakistan." *Unesco.org*. N.p., n.d. Web. <[http://www.unesco.org/education/efa/know\\_sharing/grassroots\\_stories/pakistan\\_2.shtml](http://www.unesco.org/education/efa/know_sharing/grassroots_stories/pakistan_2.shtml)>.
9. Nawaz, Karim, Frank Van Steenberg, and Rudolph Cleveringa. "Supporting the 'Big Unknown': Spate Irrigation in Pakistan." *Asia.ifad.org*. N.p., Dec. 2011. Web. Mar. 2013. <[http://asia.ifad.org/web/pakistan/home?p\\_p\\_id=1\\_WAR\\_ifad\\_newsportlet](http://asia.ifad.org/web/pakistan/home?p_p_id=1_WAR_ifad_newsportlet)>.
10. "Micro Drip." *Micro Drip | Home*. Micro Drip Ltd., 2007. Web. Mar. 2013. <<http://www.microdrip.pk/>>.
11. Pakistan. *The Official Web Portal of Pakistan*. N.p., 2011. Web. <<http://www.pakistan.gov.pk/gop/index.php?q=aHR0cDovLzE5Mi4xNjguNzAuMTM2L2dvcC8=>>.
12. "Pakistan's Food and Agriculture Systems." *Usaid.gov*. Nathan Associates Inc., Mar. 2009. Web. <[http://pdf.usaid.gov/pdf\\_docs/PNADO507.pdf](http://pdf.usaid.gov/pdf_docs/PNADO507.pdf)>.
13. "Rural Poverty In Pakistan." *Ruralpovertyportal.org*. N.p., n.d. Web. <<http://www.ruralpovertyportal.org/country/home/tags/pakistan>>.

14. "State of Basic Education In Pakistan." *Nation.com*. N.p., 2 Feb. 2013. Web. <<http://www.nation.com.pk/pakistan-news-newspaper-daily-english-online/columns/02-Feb-2013/state-of-basic-education-in-pakistan>>.

15. United States of America. Central Intelligence Agency. *Https://www.cia.gov/library/publications/the-world-factbook/index.html*. N.p., n.d. Web. <<https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html>>.