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India, Factor 9: Water and Sanitation

### **India: Clean Water and Environmental Sanitation for the Rural Population**

“In a world of plenty, no one, not a single person, should go hungry” (Harvest2050). These are the words of Ban Ki-moon, the United Nations Secretary General, when he spoke at the Rio+20 and G20 Conferences in June of 2012. Unfortunately, there are people that are still going hungry; in fact, about a quarter of the world’s undernourished people reside in India (“India,” World Food Programme). Besides food insecurity, India struggles with a lack of sanitation and a lack of accessibility to clean water. In India, approximately 626 million people practice public defecation, a statistic that accounts for almost three-quarters of the Indian population (“Water Sanitation Health- Fast Facts”). Only a quarter of the total population in India has drinking water on their premises and of that, twenty-five percent, sixty seven percent of those households do not treat their drinking water (“Water, Environment and Sanitation”). Thus, water is consumed despite being infested with chemicals and/or bacteria. The result: disease and malnutrition. This problem will only continue to grow as India’s population is expected to reach 1.69 billion people by 2050 (Goswami).

Public defecation goes hand in hand with unclean drinking water and leads to disease and malnutrition and thus pollution caused by feces mixing in with crops and water. In addition this lack of sanitation is exacerbated by a lack of hygiene products, specifically for young women, a problem that becomes an impediment not only to their education, but to their lives. These conditions are all interconnected but can be resolved by a hygienic environment in India.

The median household size in rural India is approximately four to five members (Shrinivasan). In fact, around 47.1% of rural households have four or fewer members (Shrinivasan). 70% of households are traditional nuclear families: one married couple and one to two children. However, the shrinking amount of the Indian birth rate has not been effective enough to prevent the overall population from increasing (“Why Does India Have So Many People?”). The main grains that are eaten in India are wheat and rice, but recently, consumption of fruit has increased. Mangoes, bananas, and coconuts are some of the most favored fruits in the area. Potatoes, tomatoes, and onions are the main vegetables in an Indian family’s diet. Milk, fish, chicken, goat meat and eggs are also commonly eaten throughout the family. Regarding health care, “network of government-owned and -operated sub-centres, primary health centres (PHCs) and community health centres (CHCs) distribute primary health care to rural villagers but 80% of outpatient care in an Indian rural medical facility is under the supervision of practitioners who have no formal qualifications for the job, sometimes even lacking a high school diploma” (Panagariya).

Since the early 1970’s, farm size in India “has declined from 1.84 ha to 1.32 ha” (Chand, Prasanna, Singh). The major crops in India can be divided into four categories: food grains, cash crops, plantation crops, and horticulture crops (“Major Crops of India”). Rabi, Kharif, and Zaid crops are the categories of Indian crops that are classified based on season. Rabi crops are the spring harvest/winter crop. These crops are “sown in October last and are harvested in March and April” (“Major Crops of India”). A Kharif crop is classified as the summer, or monsoon crop, and is “sown with the beginning of the first rains in July” (“Major Crops of India”). Zaid crops are grown in various parts of the country between the months of March and June.

The most common form of agricultural production is subsistence farming, but plantation agriculture and shifting agriculture are also common (Mondal). Plantation agriculture involves large-scale production where only one type of crop is cultivated. “Plantation crops are usually raised on large estates, of more

than 40 hectares (100 acres) each” (Chand). Farmers in the United States preserve soil fertility via annual crop rotation; Indian farmers practice crop shifting. Crop shifting involves planting and harvesting a designated plot of land. After a period of time, the field is set to lay fallow and the soil is replenished with its natural nutrients.

Barriers to food security in an Indian family can come in the forms of insufficient food production and high exposure to vagaries of weather (“Agriculture in India: Both Weak and Strong”). “India’s agricultural sector is also characterized by insufficient productivity, due to several factors such as the miniaturization of agricultural players, limited use of mechanized farming techniques, a lack of adequate equipment and infrastructure and the harmful consequences of the “Green Revolution” of the 1970s” (“Agriculture in India: Both Weak and Strong”). The size of the average farm is an outcome of the “post-independence farm reforms of 1947, which aimed to redistribute land to poor farmers by placing limitations on the size of real estate” (“Agriculture in India: Both Weak and Strong”). Due to a limited amount of farmland within the area, modernized farming techniques are inapplicable and an environment surrounded by outdated equipment leads to a decrease in food productivity. Due to a combined low income and a lack of knowledge, few farmers invest in the infrastructure for their farms. This lack of storage facilities decreases the ability to maintain crops leading to a lack of crops and can then lead to losses, sometimes representing forty percent of the harvest (“Agriculture in India: Both Weak and Strong”). “Additionally, only 30 percent of usable farmland is equipped with irrigation systems” (“Agriculture in India: Both Weak and Strong”). The “Green Revolution” was launched by Prime Minister Jawaharlal Nehru in the late 1970s. “The act boosted the agricultural sector by increasing yields, but also had the disadvantage of increasing production costs” (“Agriculture in India: Both Weak and Strong”). A rise in production costs led to farmers’ inability to compete and left them in debt. In addition, India’s agriculture production depends highly on the monsoon season. “Bad” monsoons provide either insufficient or excessive levels of rain, both of which can cause decreases in crop yields. Monsoons that bring excessive levels of rain lead to floods. With these floods, the feces from public defecation can be carried widely and contaminate crops, water, and homes, thus spreading disease.

Twenty-six rupees per day is the official poverty line for Indian villagers (Krasny). Although 4,500 rupees a month (Rs. 150 a day) is the National Mean Income for India, seventy-five percent of the population live below that (Krasny). With a limited amount of money, meals must be strategically planned. Shortcuts on any cost whatsoever will always be chosen. Choosing to walk long distances rather than spending money on a mode of transportation limits the amount of jobs that are available to villagers. The rural residents turn to farming or anything else within their village that may provide any kind of income.

Although India has one of the largest road systems in the world, the majority of the 2.7 million km network is in poor condition (“Improving Connectivity Across Rural India”). With limited access to all weather roads in rural areas, the monsoon season discourages travel and prevents a farmer from traveling to the market to sell their crops. Not only is the farmer not earning a profit from his crops, but those that buy food from the market have very limited choices. If the food is to eventually get to market, the nutrients within the crop may not be as beneficial when compared to the nutrition that would have been available when the food was originally harvested.

According to an estimate from UNICEF, nearly one-half of India’s children are malnourished (“The Final Frontier”). “According to the UN, countries where open defecation is most widely practiced have the highest number of deaths of children under the age of five, as well as high levels of under nutrition, high levels of poverty and large disparities between the rich and poor” (“India Tops in Open Defecation”). “India is the open defecation capital of the world with 638 million people defecating in the open” (“Campaign”). Of the one billion people worldwide that do not have access to a toilet, Indians make up

600 million (“The Final Frontier”). Public defecation can be located virtually anywhere, but is most commonly found close to a water supply due to the easy access people have to rinse themselves off with the nearby water. That means that local villagers retrieve and ingest water that is laden with bacteria. Worms can be ingested as well. This entrance of pathogens to the human body leads to diseases such as enteropathy and diarrhea. Enteropathy does not allow calories and nutrients to be absorbed, which offers an explanation for the unfaltering, increasing rate of malnourishment in Indian children. Diarrheal diseases go hand in hand with the deaths of thousands of young children each year in resource-limited countries such as India (Patil, et al). Approximately 1,000 Indian children die every day due to diarrhea (“Campaign”). These diseases affect the health and growth of the local children. The direct contact with pathogen-filled human feces leads to contamination of food and drinking water (Patil, et al). As the population continues to grow, the amount of individuals practicing public defecation will increase, therefore causing the intermixing of human feces and crops inevitable.

Despite pledging to install toilets in every home, the Indian government has put forth minimal effort to inform its citizens about the consequences of unsanitary practices. According to *The Guardian*, “India still needs to build 100 million toilets to provide everyone access, but experts say the country also needs to invest more in campaigns to change behaviours” (“Billions Have No Access to Toilets”). Unfortunately, the Indian government has “recently slashed its sanitation budget in half” (“Billions Have No Access to Toilets”). Due to a lack of attention to the issue, meager funds have produced insufficient solutions.

At the governing body meeting of State Water and Sanitation Mission in Bhubaneswar, the State Government ordered the Rural Development Department to not participate in any new Pipe Water Supply (PWS) projects unless the community is willing to take up the operation and to hand existing PWS projects to their villages by March 2016 (Express News Service). However, Chief Secretary Gokul Chandra Pati spoke to take up capacity building activities for local NGOs and community level organizations and include other self-help groups (SHGs) as coordinators in the rural sanitation campaign (Express News Service). The decision that all Indira Awaas Yojana (IAY), the social welfare flagship program that was created by the Indian government to provide rural housing for the poor, beneficiaries would be connected with Swachh Bharat Mission, an Indian cleanliness campaign formed in 2014, for the construction of toilets and would have no IAY house treated complete without a toilet was also decided (Express News Service). The Rural Development Department will initiate a campaign to influence the above poverty line households to sacrifice the grant involved with toilet constructions which is supposed to be for the below poverty line families (Express News Service). A relationship amongst the department and the Community Led Total Sanitation campaign volunteers has been ordered by the Chief Secretary that will be focused on the assortment of other development programs. According to a recent survey, approximately eighty lakh, or eighty hundred thousand, rural households do not have a latrine and five lakh toilets are in need of renovating (Express News Service). During 2015-2016, a goal of twelve lakh household latrines, 181 community toilets, and 102 solid and waste management plants are set to be constructed (Express News Service). According to *The Guardian*, “379 villages in different districts have been declared Open Defecation Free (ODF)” and “at least one block in each district will be declared ODF by October 2015” (Express News Service).

Haiti’s efforts to combat the water and sanitation epidemic provide a model for India.” The Haitian government is currently combating the water and sanitation epidemic in their own country through the use of a \$55 million two grant agreement between Wilson Laleau, the Minister of Economy and Finance and Mary Barton Dock, a World Bank representative (Haiti). The first project will take place over a course of six years and will total \$50 million. The project will pay for the services of drinking water and sustainable sanitation and will lead to a decrease in the amount of cholera cases and deaths (Haiti). The second project totals \$5 million and is implemented by the Ministry of Agriculture and will focus on strengthening hydro-meteorological services by “developing the monitoring analysis capacity of

hydrological parameters” and assist in the “development of technical tools adapted to agricultural needs” (Haiti). These two projects will help Haiti achieve sustainable development in their sanitation, water, and hydrometeorology sectors.

However, and unfortunately, India may struggle with finding \$55 million to put towards a project of this magnitude. Yet another country, Ethiopia, over the past five years “has achieved the largest decrease in the proportion of the population practising open defecation, from 92% in 1990 to 29% in 2015” through a plan that the government concocted to stop the country and the sanitation sector donors from practicing open defecation (Purvis). According to UNICEF, “the de-merging of (the) Federal Ministry of Water Resources from the Federal Ministry of Agriculture and Water Resources in 2010 is an indication of Government’s commitment to improving access sanitation facilities across the country” (“Ethiopia”). If the government of India could invest time and resources into their water and sanitation problems, positive change can happen as in Ethiopia.

When looking for an ideal solution to respond to the water and sanitation problem, India must consider the cost of maintenance for the targeted solution, a thought that Tanzania did not seem to bring into consideration when they attempted to bring clean water to their small country. In 2007, the World Bank joined with the Tanzanian government to bring in donors to fund a \$1.42 billion project that aimed to “to bring improved access to water to sixty five percent of rural Tanzanians and ninety percent of urbanites by 2010, and continue until each and every citizen had safe drinking water” (Murphy). At the start of the project, only fifty four percent of Tanzanians had access to an improved water source, a source of water that is protected from contamination; today that number has decreased to fifty three percent (Murphy). Since the commencement of the project, 3.8 million more Tanzanians lack access to improved water (Murphy). According to *Humanosphere*, “experts across Tanzania’s water industry say the program is failing to address the fundamental challenges that have plagued Tanzania’s water sector for decades” (Murphy). When looking for solutions for their water and sanitation epidemic, India needs to examine both successful and unsuccessful solutions used in other countries in order to formulate a solution that fits their countries water and sanitation needs.

On January 5, 2015, philanthropist Bill Gates announced another part of the Gate’s Foundation’ mission to improve sanitation in poor countries. That part is the Omni Processor. The Omni Processor is a machine invented by Janicki Bioenergy. The machine’s sole purpose is to convert human feces into drinkable water and produce power and ash by using a steam engine. The Omni Processor can intake 12.3 cubic meters of sewer sludge per day in order to begin the conversion from feces into water (“Janicki Bioenergy”). First, feces travels into the machine and is then boiled inside a large tube. The boiling allows water vapor to separate from the solid waste. The vapor then gets cleansed through the use of filters and a cyclone to remove any further potentially dangerous particles. The water treatment adjusts the pH. Condensation occurs, which allows for the production of clean drinking water. Around 10,800 liters of water can be produced each day, along with 150 kW (“Janicki Bioenergy”). The water meets the requirements for the United States FDA and the World Health Organization. According to *Forbes.com*, the Omni Processor’s current cost is approximately \$1.5 million. Janicki Bioenergy’s objective is to lower the price of the machine to the point where entrepreneurs in developing countries will want to invest and start their own waste-treatment businesses (Chowdhry). The machine pays for itself, because it produces electricity, water, and ash (Chowdhry). The company, located in Washington, is already moving forward to test the Omni Processor in Senegal in April of 2015. “Janicki’s engineers plugged sensors and webcams into the Omni Processor so that they can control it remotely and communicate with the team in Senegal so that it can fix problems if they arise” (Chowdhry). As new as a development this is, further research will need to be conducted in order to make the machine accessible to any developing country. This could take over a year. Eventually, the machine could potentially be located in rural India, where it could bring clean water and electricity to villages and the surrounding area.

Columbia University's Sustainable Engineering Lab has recently installed the first of three battery-less solar powered irrigation pilot systems in Senegal. "Each system provides clean energy to power water pumps for 7 horticulture farmers in rural Senegal as part of USAID's Powering Agriculture grant" (Humphrey). The 6.8kW array of solar panels was installed at a fixed tilt (15 degrees) (Humphrey). According to the Engineering lab, in order "to stay below the upper voltage limits of the controller (750V), we wired up the panels using two parallel strings of 17 panels each (3.4kW)" (Humphrey). The land for the device was provided by the community (Humphrey). "However, with weather drawbacks the device brings along some complications. Manual controls are required for functioning on cloudy days and automated controls are in use during clear and sunny days. The controller is housed in a concrete building where it will be operated as a micro utility, selling water as a service to local farmers" (Humphrey). Introducing this device to rural India would open up the opportunity to easily provide clean water. Applied to irrigation for agriculture, this device could increase the amount of crops produced for the surrounding area and reduce deaths due to malnourishment.

Water.org is a program that installs wells that deliver sanitary water to a community ("Solutions"). Fortunately, the company has already involved itself in rural and urban Indian communities in 11 states and one Union Territory: Andhra Pradesh, Karnataka, Madhya Pradesh, Maharsashtra, Rajashthan, Bihar, Chhattisgarh, Orissa, West Bengal, Assam, Tamil Nadu and Pondicherry (UT).

Water.org offers both grants and WaterCredit, a program that uses microfinance tools to offer small loans to households in India ("India," Water.org). The program is unique due to the fact that the employees are the locals in the targeted area. "Locally-based partners are better positioned to understand and navigate social, political, and economic issues impacting projects" ("Solutions"). "They are also more informed about local financial resources for cost-sharing in projects" ("Solutions"). Water.org enlists and informs the locals on how to help construct the project, which decreases cost. However, if a problem occurs that locals are unable to solve, the local organization will offer help. This is paid for by the regular maintenance fees collected by the communities' water committees ("Solutions"). During the production of the project, Water.org provides training and motivational seminars over the relationship link between good health and good hygiene ("Solutions"). Unfortunately, if people have no understanding of disease and hygiene, safe water benefits and sanitation are useless.

In order to introduce proper hygiene techniques in rural India, "teachers" must target the older generation of Indian villagers, such as parents. Village leaders would make ideal candidates as they possess the respect and trust of their village. By having this power over the targeted village, the chance of success in teaching proper hygiene greatly increases when compared to the attempt by an unknown, untrustworthy "teacher". In order for this process to succeed, teachers must be patient and discover a way to explain and demonstrate why proper hygiene is extremely vital to the overall well-being of the village. Formal educational institutes or an informal method may be required depending on the current state and character of the intended village. Once the older generation of villagers have begun practicing proper hygiene, they will take on the role of a model citizen and allow these methods to become mimicked by village youth. If adolescents begin to follow the proper methods, they will pass hygienic behavior on to their children causing a cycle of proper hygiene to begin.

Through investment and advertisement, Columbia's solar panels and the Water.org program can be applied to solve the water and sanitation crisis in India more quickly than any device such as the Omni Processor can be developed enough in order to be activated in the rural areas.

"Sixty six percent of girls' schools do not have functioning girl toilets in India resulting in a dropout rate of more than forty four percent of girls after finishing year 5" ("Campaign"). Approximately twenty three percent of young girls drop out of school every year due to an insufficient amount of menstrual hygiene facilities such as toilets ("Campaign"). These young ladies must marry because they have no skills and

no education. If the young girl chooses not to marry, she may find herself stumbling into servitude or prostitution in order to survive (Rodarte).

“Women cultivators and agriculture laborers perform about 70% of all the agriculture activities” (“India: Women Farmers Persevere”). However, once the mother is malnourished, she is unable to keep up with her daily responsibilities around the household or the farm. If she were to become pregnant while malnourished, her child would be malnourished at birth, thus bringing into the world more malnourished children. If those children are girls, they may continue the cycle of malnourishment.

Not only does a lack of sanitation affect women’s educations and futures, but their safety. “When women and children have to relieve themselves, they are forced to venture into the streets rather than using a toilet in the safety of their own home, which compromises their safety” (Prentice). In fact, local authorities in Bihar stated that nearly 400 women would have “avoided rape last year if they had toilets in their homes” (Prentice).

With unclean water come disease and unsanitary environments that affect the world’s most precious gift, the gift of life. Indian girls drop out of school because their basic human rights are not being met. The lack of toilets and feminine hygiene products leads to an unsanitary environment. The unsanitary environment promotes public defecation. Public defecation then leads to unclean water. Unclean water then leads to crops that are unable sustain villagers. Not only is the girl left with no money, but she is left to fend for herself. Prostitution and many more bad lifestyles seem to be the only doors open for such a young lady. Since she has no education, she is unable to contribute to society and continues the cycle of poverty.

Programs such as HEEAL, the Wherever the Need-Women’s Eco-Sanitation Toilets India, and BeGirl are directed to solving the sanitation problems uniquely associated with women and girls. “HEEALS is a non-profit organisation registered under the Indian Government Societies Act 21 of 1860” (“Campaign”). HEEALS works to “improve the sanitation and hygiene conditions of girls and children” (“Campaign”). HEEALS targets rural areas, urban slums, refugee camps and orphanages (“Campaign”). The organization provides toilets in areas with the highest demand, water purification tablets, water tanks, soap and sanitary napkins (“Campaign”). By using games and modeling hygienic behaviors, HEEALS addresses issues of sanitation and hygiene. For example, HEEALS demonstrates proper ways to wash hands and use sanitary pads at home (HEEAL). They also provide facilities with supplies such as soaps, sanitary pads and hand water, sanitation, and hygiene (WASH) stations (“Campaign”).

Wherever the Need (WTN) provides women-only eco-sanitation toilets. This program provides an enclosed, safe, and secure facility that houses four stalls. They also offer a child friendly area, a bathing area, and a clothes washing area (“Women's Eco-Sanitation Toilets India”).Eco-sanitation/compost toilets sit on an elevated platform above two chambers. One chamber in use while the other is composting. Organic material is added to the chambers to allow carbon that can be used for compost to enter. This carbon oxygenates the composting process and neutralizes odors (“Women's Eco-Sanitation Toilets India”). Pathogen free compost can be produced within a time span of about five months. Feces and urine are not permitted to mix due to the foul odor the combination produces. This is prevented through a pipe that takes urine to a separate chamber. This pipe may be used to make pellets that can also be used to nourish soils for crop growth (“Women's Eco-Sanitation Toilets India”).

The program also offers a full education program to local residents. The building is built by the local women. The cost for this facility is approximately £3,500 and can be used by up to 350 women and children (“Women's Eco-Sanitation Toilets India”).This program not only offers a sanitary environment, but the soil fertility is increased through the compost and urine and therefore crop yields improve. By improving crop yields, the production of food will increase. WTN is a successful program because the

company focuses on simplicity as their solution. WTN spotlights the “simple act of building a toilet reduces pollution, disease and sickness, it creates healthy communities, promotes self-respect and dignity, and underpins education and livelihoods” (“About Us”). Since the establishment of WTN in 1997, the program has transformed over 50,000 lives in India amongst other countries (“About Us”).

BE GIRL is a program that aims to make menstrual hygiene technology and practices accessible to young women all over the world by offering reusable washable absorbent holder pads and underwear. BE GIRL also works to bring not only equality among men and women, but equality among women, by offering the same high-quality products to all customers. The program has currently “reached over 3000 girls with 4,095 product units distributed throughout nine countries: Rwanda, Malawi, Uganda, Tanzania, Mali, Jordan, Morocco, Kenya, and Ethiopia” (“Impact Beyond a Pad”). In a personal interview with BE GIRL’s Operations Guru, Stephanie Rapp-LeGrand, there is confirmation that there is no current supplier established within India (Rapp-LeGrand). However, the opportunity for BE GIRL products to exist within India (or in any other country) depends solely on the demand from existing NGO’s and other independent programs requesting a product order (Rapp-LeGrand). If there were to be an NGO or distributor, BE GIRL would be open to the idea of perhaps forming a partnership or a more permanent presence within India (Rapp-LeGrand).

BE GIRL’s products are manufactured in Colombia by head of household women (“Impact Beyond a Pad”). One of the co-founders, Diana Sierra, visits often and is available to have a strong, hands-on presence within the Colombian factory’s production (Rapp-LeGrand). The BE GIRL Flexi-Pad is the world’s only reusable washable absorbent holder pad and allows the user to insert any safe absorbent disposable or reusable material every four hours (“Products”). The Flexi-Pad was designed by a collaboration between Sierra and young women in Uganda. With a cotton trim to protect the skin from irritation, stain free material, a leak-proof nylon inner layer, an indoor dry time of less than sixty minutes, and printed instructions on the pad for correct use, the Flexi-Pad is the ideal product for young women that will reduce school absences and promote contribution to (“Products”). The second product is the BE GIRL Panty-Pad, which was designed after the Flexi-Pad in response to the targeted area’s lack of underwear for young women (Rapp-LeGrand). The Panty-Pad utilizes an absorbent holder pouch which results in a “highly durable, washable, waterproof, and flexible underwear for repeated use without compromising performance” (“Products”). BE GIRL’s products are solutions because they adapt to resources based on location, have a 100% leak protection and comfort guarantee, low indoor drying time which offers privacy for the user, the quick-dry fabric saves water for washing, and the stain-free characteristic allows for an easy wash and dry (“Products”). With the Panty-Pad providing two years and the Flexi-Pad providing one year of protection, the BE GIRL products are cost effective, as the user is only required to change the filler and wash the product, and are easily usable by people of all age, race, and culture (“Products”). As the BE GIRL Company begins to grow into a global brand with the help of donations, the arrival of new products and a buy one, get one product system are to arrive sometime in the fall of 2015 (Rapp-LeGrand). Pre-existing NGO’s and NGO sub-programs purchase the BE GIRL products and are able to introduce them to the villages through the use of their existing relationship between the company and the locals (Rapp-LeGrand).

If there were to be a common voice and donations, there may be a possibility to bring BE GIRL and their products to rural India. By breaking down the taboo barriers over menstrual hygiene and informing their customers about the negative impact of disposable tools, BE GIRL is working to promote feminine hygiene care to all the young women of the world.

With over half of the population without access to a toilet, Indians turn to public defecation. Defecating in the open leads to an unsanitary environment that promotes infestation of bacteria and other hazardous chemicals within the water that is being drunk and that which is used to water crops. The polluted water

leads to diseases that infect the locals. Women are especially prone to these diseases as they tend to be the water gatherers of the family. An unsanitary environment can also include a lack of access to feminine hygiene products. This absence of such products leads to girls staying home from school. A minimum week of absences can impair a young lady's educational career. With so many absences, the chance of dropouts increases. If a young woman chooses not to follow down the traditional marriage path, she may enter into the world of bad choices, such as drugs or prostitution. No education also means no contribution to society, which results in a continuous cycle of uneducated women and still no feminine hygiene products.

With that said, there are solutions that can be applied to this urgent problem. The Omni Processor and Columbia's Solar Panels are technological revolutions that have the potential to solve the unclean water epidemic in India, and if thinking globally, the world too. With the proper amount of investments, the manufacturers of these two devices will then perfect their techniques, speeding up the ability to scale up and distribute their products throughout the country. Programs such as Water.org, HEEALS, Wherever the Need, and BeGirl are trying to resolve the problems of both unclean water and feminine hygiene products. By installing wells, supplying toilets and compost toilets, and providing sanitation seminars to the locals, supplying young women with feminine hygiene products these companies are making an impact in India and other countries and will continue to do so if they receive more support from donors and investors.

All of these solutions will bring clean water to rural India and provide a sanitary environment for villagers. The benefits of these programs and devices will improve daily life. With clean water, the number of malnourished and sick locals will decrease. Also, no longer will polluted water contaminate the fields of food; therefore, food production will increase. Once there are healthy and clean people within a village, the focus on school and achieving an education will be more realistic. By investing in the compost toilets supplied by Wherever the Need, the compost that is produced will increase the amount of crop yield for the surrounding area. In short, safe water and a hygienic environment will have positive impacts that range from eliminating disease to increasing education.

In the words of José Graziano da Silva, the United Nations Food and Agriculture Organization (FAO) Director-General, "The quest for food security can be the common thread that links the different challenges we face and helps build a sustainable future" (Harvest2050). By applying the listed solutions, five out of the eight Millennium Development Goals of 2015 would be addressed in India: the eradication of extreme poverty and hunger, an increase in educated young women (which would correlate with the promotion of gender equality and empowerment of women), the reduction of child mortality, and improvements to maternal health ("Millennium Development Goals"). These programs are not the only solutions to fixing food insecurity in India or globally, but they are steps in the right direction.



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