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India, Factor 2: Water Scarcity

India: Improving Water Management

Introduction:

The Republic of India has been industrializing rapidly, and when most people think of India, they imagine large crowded cities like New Dehli and Kolkata. While it is true that Indian cities are some of the most densely populated in the world, this is only a fraction of their people, roughly thirty percent. Seventy percent of Indians live in agrarian villages and are directly involved in agricultural activities (“Issues and Priorities for Agriculture”). Since such a large majority of people depend on agriculture, its success is imperative for the success of the nation. This industry fuels India’s economy and provides sustenance for its people.

In rural India, joint families, consisting of an Indian woman who has married and moved in with her husband’s family, are most common. This family is composed of the husband’s mother, father, brothers, his brothers’ wives, young sisters, and his nieces and nephews, and is generally patriarchal, but, in some cases, may be matriarchal. These joint families are most common in rural areas.

The diet of Indians varies greatly based on area and religious affiliations. North Indians eat many types of breads, including *naan* and *tandoori roti* (Sarkar). They also enjoy curries with moderately spicy gravies and dried fruits and nuts (Sarkar). Dairy foods like milk, cottage cheese, and yogurt are also widely consumed in the Northern states (Sarkar). In the South, rice is a staple. They mainly enjoy rice with a thick spicy broth called *rasam* (“Food in India”). Lentils are also extremely popular (“Food in India”). Southern Indian cuisine includes intense spices like black pepper, cardamom, and curry leaves in everyday dishes (“The Hathi Cooks”). Most Indians are vegetarian due to religious restrictions. For example, Hindus consider cattle to be sacred, so beef is avoided (“Food in India”). Additionally, Muslims avoid pork (“Food in India”). All Indians enjoy their food in several small meals throughout the day. In short, Indian eating habits differ greatly based on region and religion.

Rural Indian education leaves much to be desired. In rural areas, where three quarters of India’s population resides, most children must travel to different towns for schooling. This travel is both expensive and time consuming. For this reason, many Indian parents choose not to educate their children. Also, these schools are not very high quality. A single teacher is expected to educate up to one hundred pupils of varying grade levels. Teachers are also quite underpaid because the rural families are not able to provide fair compensation for their work. Because of this, many teachers do not value their jobs and are absent often. Their teaching materials are also sub-par. The textbooks are usually cast-offs from American schools and are written in English. These are of little use to children who speak Hindi at home. This lack of education makes it unlikely that rural Indian children will have any other career opportunities outside of farm life.

Indians also have little access to healthcare. As with education, most Indians must travel for healthcare. A report conducted by the United Nations found that seventy-five percent of health infrastructure, like doctors and specialists, is located in urban areas (Dasgupta). This care is often very low quality. In fact, most clinics do not even have a doctor on staff (“Rural Health Care”). The World Health Organization has found that India has only half of the Community Health Centers that are necessary for all Indians to have access to healthcare (Singh and Badaya). Currently, the country has only 3,346 of these Community Health Centers (Singh and Badaya). There are also gaps in the services offered. For example, in the clinics, maternal health is only focused on family planning and prenatal care instead of labor and delivery,

where most deaths occur (“Rural Health Care”). This lack of labor and delivery care is due to the great distance that must be traversed to seek treatment. Most women who are in labor are unable to make the trip to a clinic. Also, due to the failure of public health clinics, most rural Indians visit a private health provider. These providers are not regulated by the government, so corruption runs rampant. They often require illiterate patients to sign documents that require them to pay ridiculous fees, and do not inform them of the risks (“Rural Health Care”). Many times, these health providers are not even doctors! (“Rural Health Care”). For this reason, among others, many rural Indians are plunged into debt (“Rural Health Care”). As one can see, the condition of rural Indian health care is deplorable.

The climate of India is largely dependent on the monsoons. Monsoons are seasonal winds that bring rain (“Climate of India”). The monsoon season runs from May to September (“Climate of India”). The country enjoys a largely tropical climate, except for the Himalayan north where the climate is temperate (“India Climate”). While some land is cultivated in all twenty-six states of India, the highest producing states are located in the central region of India (“India Climate”). These states include Madhya Pradesh, Maharashtra, and Uttar Pradesh (“India Climate”).

The average farmer owns several small pieces of land and consumes much of what he grows. He tends this land without the use of technology (“Agriculture in India”). Due to the majority of people avoiding pork and beef, the main focus of Indian agriculture is crop production. India plants more land with rice than any other country (Raghavan). However, its yields per hectare are far below other countries’ yields per hectare (Raghavan). For example, if India’s rice yield rate was at China’s level, it could double the amount of rice produced from the same amount of land (Raghavan). Therefore, India has much room for improvement. Most farmers grow food crops, and few raise animals. Since India’s climate is tropical, many different crops can be grown year-round (“Climate of India”). In the *kharif*, or monsoon season, which lasts from May to September, rice is the main crop (“Agriculture in India”). Rice is the most important food crop in India, so during *kharif*, almost all arable land is planted with rice (“Agriculture in India”). Other *kharif* crops include millet, soybeans, maize, groundnuts, and cotton (“Agriculture in India”). *Rabi* is the winter season. It runs from November to March, when wheat, gram, pea, linseed, and mustard crops are grown (“Agriculture in India”). Seasonal, irrigated crops, like fruits and vegetables, are called *zaid* crops (“Agriculture in India”). *Zaid* crops can be grown year-round as long as the land is irrigated (“Agriculture in India”). Farming practices in India are very primitive and must be improved.

The Problem:

Agriculture is vital to the Indian economy, so improving farming methods is incredibly important. The 1960’s and 1970’s brought many agricultural advancements to India. This period is called The Green Revolution. These advancements include utilizing high yield seeds, irrigation, and chemicals to produce crops (Zwerdling). The Green Revolution brought agricultural independence to India, allowing it not only to feed its people but also to export its crops (Zwerdling). However, this growth was unsustainable. The high yield seeds required much more water than was naturally available, so farmers drilled wells and irrigated with groundwater (Zwerdling). Irrigation with groundwater has been successful for many years, but now the farmers are removing more water than can be replenished (Zwerdling). The farmers must install powerful pumps that cost thousands of dollars to continue to bring water to the surface to cultivate these high yield seeds (Zwerdling). Most farmers must take out loans to afford the pumps and are plunged into debt (Zwerdling). In fact, about fifty-two percent of agricultural households in India are in debt (Umar). They essentially become slaves of their lenders. Perhaps this led to the dramatic rise in the suicide rate of Indian farmers (Umar). Three hundred thousand Indian farmers have ended their lives in the last twenty years; that is forty-seven percent higher than the average Indian suicide rate (Umar).

Forty-one farmers commit suicide every day in India (Umar). It is evident that Indian farmers do not feel valued, and that needs to change.

In India, most crops require a large amount of water. These high-water crops include the economically important tea, rice, groundnuts, and sugarcane, as well as high yield wheat and cotton. India's climate does not always support the cultivation of these plants. In fact, over the past two years, the country has received fourteen percent less rainfall than average ("India Gets Lower Rainfall"). In some areas, rainfall was down forty-seven percent from previous years ("India Gets Lower Rainfall"). This deficit has caused major problems for India, both inside and outside the agricultural sector ("India Gets Lower Rainfall"). It has caused decreases in yields, which has impacted farmers' financial standings. It has also reduced the amount of available drinking water for Indians residing in rural areas. This water shortage has caused major problems for India, and it is only expected to get worse. Climate change is predicted to affect India greatly over the next few decades. The change in weather pattern will make already unpredictable monsoons even more erratic ("India Gets Lower Rainfall"). This will affect a large portion of the country because two thirds of cropped land in India is dependent on rainfall from the monsoons ("Agriculture in India"). When previously faced with water scarcity, Indians have deepened wells and utilized groundwater to provide for their crops ("Agriculture in India"). This practice has been effective for many years, but the groundwater is not being replenished quickly enough. In some places, the water table has dropped as much as three feet every year! (Zwerdling). Therefore, this is not a sustainable answer. India needs a better solution for the years to come.

The Solution:

To solve India's water problem, farmers must work together with scientists to improve their situation. One way to do this is to collect seeds from plants that have demonstrated a superior ability to survive in drought-like conditions. The average farming family has the ability to evaluate plants and save seeds. Allowing the plants with these traits to reproduce will ensure that the next generation has the characteristics necessary to survive drought-like conditions. Another method to improve water usage is to catch and preserve rain. There are several ways to accomplish this. One is to practice water harvesting tillage. This is a method where farmers deliberately leave large divots in their fields while tilling the soil. These divots catch water from the high intensity monsoons which continues to nourish the plants, even after most surface water has run off. Large ponds or reservoirs could also perform this purpose. This also allows greater surface infiltration by the water. An effective method to deliver the water caught in the reservoirs and ponds to the plants is drip irrigation. Traditionally, Indians have used wasteful field application methods like center pivot irrigation. These systems spray water over the fields and require very high water pressure. Drip irrigation systems should be installed to reduce this waste. These systems reduce water waste by providing a dripper to dispense water to every individual plant. It also reduces evaporation because water is delivered directly to the plant's roots ("Drip Irrigation"). Additionally, drip irrigation eliminates the need for high water pressure. This system is relatively inexpensive to install, and is very effective in reducing water use ("Drip Irrigation"). Installing drip irrigation can result in water savings up to seventy percent ("Drip Irrigation"). The system also greatly reduces labor and provides an effective means to deliver fertilizer to individual plants ("Drip Irrigation"). International Development Enterprises, a nonprofit which is dedicated to eradicating rural poverty through tools and knowledge instead of financial handouts, has been active in India ("Drip Irrigation"). This organization provides farm families with inexpensive drip irrigation systems and the training to properly utilize them ("Drip Irrigation"). Currently, its work is only active in two states of India's twenty-six, but it is important that these skills and knowledge be spread ("Drip Irrigation"). International Development Enterprises' drip irrigation program should be scaled up to benefit the farmers of India. Also, the Food and Agriculture Organization of the United Nations has a great deal of knowledge concerning proper irrigation methods ("Water Development and Management Unit"). The FAO, for short, provides technical assistance to farmers by hosting training in the field on proper use of irrigation systems ("Water Development and Management Unit"). The training that FAO can provide is just as valuable as the physical systems, so its

programs should be expanded. Since organizations like International Development Enterprises and the Food and Agricultural Organization of the United Nations are already working to improve the lives of the Indian farmer, their activities should be financially supported by the Indian government. However, it is still important for the methods of catching rainfall and selecting plants to be utilized, because they are very effective short-term solutions. Still, India needs more permanent change. This can be accomplished by teaming up with researchers to develop drought tolerant crop varieties. Scientists in the United States have already been implementing this technology, so perhaps information could be shared. However, it is important for India to develop crop varieties that will perform well under its unique climatic and geographical conditions instead of simply purchasing seeds from other countries. Producing these new varieties would eliminate the need for farmers to evaluate, collect, and replant seeds from successful plants. Indian agriculture will always be dependent on monsoon rains, but, by using all or a combination of these recommendations, Indian farmers can generate profit to pay off debts, feel valued, and feed their people.

The economy of India, as a whole, depends on its agricultural sector; therefore, agricultural success is imperative for the success of the nation. In order to be successful, and feed their people, Indians must continue to innovate and discover new water delivery and storage systems. Prime Minister Narendra Modi understands this. While addressing agricultural scientists, he said, “Per drop, more crop should be our mantra for better productivity from each drop of water” (Mohan). The solutions outlined in this paper will help India to reach its goal of more crop per drop.

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