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India: Public and Private Infrastructure Investments to Enhance Efficiencies in Food Harvesting, Storage, Processing, and Preservation to Alleviate Hunger

"The difference between what we do and what we are capable of doing would suffice to solve most of the world's problems."

-- Mahatma Gandhi, Indian Spiritual and Political leader

Webster's Dictionary defines hunger as a craving or urgent need for food or a specific nutrient. For many around the world, hunger is much more than just a craving; it is a lifestyle. Some people are so used to hunger in their lives that they have no recollection of what it is like to feel anything but hunger. Currently, one in eight people do not know the feeling of a full stomach (World Food Programme). This devastating hunger is the cause of malnutrition, the largest single contributor to disease. A lack of essential nutrients for children leads to many side effects, the greatest being a lack of growth. Nestled in Southern Asia lies a country with almost quadruple the population of the United States, but with only one-third of its land mass. You have not seen hunger and malnutrition to its greatest power until you have seen the poor of India. Children look as if they are eight, but in reality could be more than eighteen years old. Some may finally be fed properly for what could be the first time in their lives. They may no longer feel the hunger, but the malnutrition they have experienced as children will never leave them. The first two years of a child's life are critical to their growth. Under-nutrition during this time period causes largely irreversible damage for the rest of this child's life (World Food Programme). Fulfilling the needs of India's large population takes much more effort than better utilization of the farmland. Affordability is the main cause of malnutrition in India – especially for the poor. To ensure that there is an abundance of crops throughout the year, better food preservation techniques need to be implemented. More reliable cold storage facilities, food processing, food packaging, and sanitary markets will all allow better food distribution throughout India. Better food packaging methods will allow more food to be exported out of India as well, improving the profitability of farming and at the same time, improving the nutritional status of the nation. This, in turn, will create a better economy for India as well as a more nutritionally competent population. Fruit and vegetable production is very seasonal. This causes an inflation of prices during the season they are not grown, while most of the crop goes to waste during the production season. This results in seasonal consumption of fruits and vegetables, due to price fluctuations for the consumer and loss of crop value for the farmer.

Approximately 70% of India's population lives in rural areas. About 30% of the rural Indian population lives in poverty. This means that 231,631,442 people make up the Indian rural poor. Almost 80% of poor rural people are members of a specific tribe or caste (Rural Poverty in India). The caste system is not as important as it has been in the past, but the income of the castes has stayed the same. The farmers tend to remain poor and have not seen the recent boom in the economy, as it is associated with the technology industry. Rural families in India tend to be large. Grandparents usually live with their children and grandchildren. Each family consists of many children as well. These children often do not attend school as they contribute to their family's survival by working in the farm or as day labor. The literacy rate in India is low (62.8%) compared to the U.S. (99.9%) due to the high cost of education, as well as the lack of proper infrastructure (India: Statistics).

The diet of an average Indian depends mainly on the region in which they live. Northern Indians tend to eat more flat breads while South Indians prefer rice. In coastal states, fish is very popular. Religion also

plays a large role in the Indian diet. Hindus do not eat beef and Muslims do not eat pork. Many Indians also tend to be vegetarian (Food in India). Lentils, tomatoes, mangoes, onions, eggplant, and chilies are often used in Indian dishes. Although the Indian diet seems to be nutritionally sufficient, the rural poor cannot usually afford the nutritionally rich food. While animal protein is the most complete protein source, the consumption of meat is very low in India due to the cost. The high food costs and low rural income are the main causes for undernourishment. The poorest of the rural population also tend to work more physically than others. This causes their bodies to need even more nutrients than average Indians. The average rural citizen's body requires him or her to eat an average of 2,400 kilocalories a day. However, the poorest 10% of the rural population consumes an average of 1,619 kilocalories per day (Varma).

The risk of disease for the rural poor is also greater in India. Access to sanitary facilities has only been improved for 23% of India's rural population (India: Statistics). Although public health care is available, the quality of and access to the health care is low. The hospital bed density is 1 bed per 1,000 people and physician density is 0.6 physicians per 1,000 people (India: Statistics). Many people cannot afford healthcare as well. With 60% of India's rural population living on less than a dollar a day (PTI), healthcare is not affordable for the rural poor. Insurance is also not affordable in rural India. Nearly 72% of India's population does not have any kind of health insurance (Healthcare in India).

With the Himalayas to its north and the Indian Ocean to its south, India is considered the perfect location for agriculture and ancient civilizations developed in the sub-continent. India receives an adequate amount of rainfall and has a warm climate all year round. Winters often have temperatures between 50-77°F while summers can reach highs of 104°F (India Climate). Fertile soil is also commonly found in India. However, due to the introduction of pesticides, Indian soil is starting to become less fertile (Sharma). The location and fertile soil of India also provide for a very efficient agricultural system.

A significant proportion of the population in India is engaged in agriculture. Indian farms often do not rely on machinery. While mechanization in agricultural sector is increasing slowly, its adoption is slow and manual labor is still involved in agricultural production. Rice and other crops are planted by hand. This is a good way of ensuring jobs for more rural Indians. Rice, mangoes, wheat, tomatoes, potatoes, maize, and sugarcane are all crops that are grown in India. While meat is not as popular in India as it is in other countries, chicken is often raised and eaten. Cows are raised to produce milk. Milk is essential to the diet of a poor rural Indian family. It provides a balance of essential nutrients. Fresh fruits and vegetables can be purchased either at a local market or even at the side of the street.

Due to its great agricultural efficiency, India is currently the world's leading producer of fresh fruits, vegetables, pulses, rice, and wheat. However, malnutrition remains a major problem to most of its population. The poor infrastructure contributes greatly to the food distribution problems that India is facing. There is no presence of grocery stores in rural areas. Transportation is not affordable to the lower class, so most rural Indians cannot travel to urban areas in order to purchase food, nor can they transport the food they are producing to commercial centers. The average distance travelled by an Indian truck is 250 to 300 kilometers a day. On the other hand, the international average of miles driven by a truck is 600 to 800 kilometers a day. The payload for Indian trucks is low and most of India's roads can only support approximately 16.2 tons, while the International average supported by roads is 36 tons (Barriers in Indian Food Supply Chain Management). To allow for better food distribution throughout India, the infrastructure of its roads must be improved.

Money is the main barrier that is preventing the construction of newer and stronger roads. The Indian government budgets their money so it will be distributed to different sectors based on their needs. Several five-year plans have been used in the past in order to modernize India's roads. However, this plan ended unsuccessfully due to the lack of efficient road construction workers. Currently, India is implementing

their 12th five-year plan that will last until 2017. The capacity of the Indian government to build better roads is high. If the lack of experienced workers would change then the capacity to build stronger roads will change (Indian Road Construction Industry). Education could be provided to these workers from foreigners who have experience working in larger firms to build strong and efficient roads. Providing this education to build stronger roads would allow the Indian government a gap between five-year plans in order to focus their money on other areas.

As mentioned previously, the average family earns less than one dollar a day. Selling food on the side of the road does not generate the same amount of money for families as selling food to grocery stores in urban areas. Furthermore, there are often flies, mosquitos, and other possibly harmful pests surrounding foods sold in an outdoor market as well since they are not sold in sanitary conditions. This causes food spoilage to occur.

Food is often lost or wasted during five parts of the food processing chain: *agricultural production, postharvest handling and storage, processing, distribution, and consumption*. In developing countries such as India, nearly 40% of the food losses occur during post harvest and processing levels (Gustavsson, Christel, Sonesson, and Van Otterdijk). Due to the lack of efficient cold storage facilities, one third of the perishable food produced goes to waste (Barriers in Indian Food Supply Chain Management). If there is a low supply of a certain food, its prices increase drastically. Reducing the rate of food waste will improve the affordability of these foods.

Pollution and energy both affect food spoilage. As previously mentioned, India's cold storage system is below the standards of other countries. There is not enough energy supply in India to provide for its large population's needs. However, food storage should be a priority. Solar and wind energy could be manipulated in order to create more energy to go towards cold storage facilities. Since most produce is sold on the streets of India, pollution is another reason for food spoilage. Proper warehousing of food during the retail phase is necessary and will be highly successful in keeping food from spoiling. As India's population continues to grow, the need for food will continue to increase. If food cannot be distributed throughout India in a shorter amount of time then even more of people will be affected by malnutrition.

Nearly one-third of food produced is actually consumed by humans. This means that approximately 1.3 billion tons per year, which could feed the total global population of 7 billion, is either lost or wasted (Thomas). Packaging, storage, and transportation are all factors that contribute to these major food losses. During the distribution process, food needs to be packaged and stored in a way that will allow it to stay fresh until it reaches the market. Compared to industrialized countries, developing countries do not waste as much food. In industrialized countries where food is more plentiful, ironically, more food is wasted each day. There is not much that can be done to prevent food waste by the poor rural population of India. However, the upper and middle class population could work towards either eating all the food they have or feeding the poor. Wealthier Indians must work together to create better storage facilities and the government must work to build better roads. Distributing food at a much faster rate will allow it to keep from spoiling and being wasted. It takes a team effort to decrease the food wastes in India. Communities must come together to fund the building of grocery stores and warehouses that will create for better distribution. The Indian government should also work with foreign allies in order to create a better food market.

Over 300 million Indians are major consumers of processed food. However, this number of people consists of mostly upper and middle-income consumers (India Country Profile). The lack of access to these processed materials is another major reason why food is not affordable to the poor rural population of India. In America, processed foods continue to become more popular. They provide consumers with a cheaper and safer food source. The food purchased in the U.S. is rarely spoiled.

Storage warehouses as well as cold storage facilities are essential for the preservation of food. Due to the lack of speed in the Indian distribution system, proper food storage is essential to prevent food wastes. India currently loses more fruit and vegetables than the United Kingdom consumes and more grain than Australia produces during its storage process (Thomas). Storage warehouses have not changed for many years; however, the rate of crop production has increased. With the government's support, private investors need to invest in larger and more modern storage warehouses. Better storage would result in more food that can be sold.

The main factor that is preventing India from having an adequate food supply is the fact that most food undergoes a low level of processing. Most commodities are bought and sold fresh. This is a problem because most crops grow exclusively during certain seasons. Take mangoes for example. Mangoes are a very popular crop grown mainly during the summer and require specific environmental conditions. During mango season, their prices drop due to a high abundance and many are wasted. When it isn't mango season, their prices increase radically. If mangoes were to be preserved as juice and sauce then there would not be as many mangoes wasted.

Educating Indian citizens on the benefits of efficient storage facilities, stronger roads, and better processing techniques will increase the likelihood that the government, as well as the private sector, will take action. Upper class citizens could receive incentives, such as tax deductions, if they invest in storage facilities or food processing centers. Building these facilities would highly benefit the investors since more rural citizens would buy their products.

The World Food Programme is a foundation that is currently working towards ending world hunger. This foundation purchases food to feed the world's hungry, so they buy in a way that will benefit developing countries. The World Food Programme buys nearly 75% of their food from developing countries (World Food Programme). This gives farmers the opportunity to improve their profit. These farmers will then have the purchasing power to invest in better storage and processing. One of WFP's strategic objectives for India is to improve livelihoods for vulnerable communities that rely on depleted natural resources in degraded environments. The World Food Programme has been very successful in assisting countries where malnutrition is prevalent.

To create a stronger distribution program throughout India, the government and private investors must work together in order to build stronger farm to market transportation system, implement better processing and packaging techniques, and build larger and more efficient storage facilities. Mahatma Gandhi once said, "The difference between what we do and what we are capable of doing would suffice to solve most of the world's problems." We have seen changes occur throughout the world that help prevent food spoilage and waste. India has the world's second largest population and also is the world's top producer of several crops. India grows a sufficient amount of crops year round to provide for its entire population; however, a high amount of these products goes to waste. Many other countries don't produce as much food as India, but their populations don't suffer from the extent of malnutrition as Indians do. Preventing waste and spoilage would bring India one step closer to abolishing hunger and malnutrition. To create a stronger food distribution system, India must work with other countries in order to further implement the methods that they are already using. India is capable of creating a stronger food distribution system; these solutions just need to be more fully implemented. Currently, India is not close to achieving and has not achieved any of their millennium goals (India: Progress by Goal). Achieving the goal of creating strong global partnerships would allow India to create a strong food distribution system. Foreign investors, as well as Indian investors, could provide the funds to build stronger storage facilities, better processing and packaging systems, and sanitary grocery stores. Utilizing energy sources as well as investing government money to avoid food wastes will benefit the Indian population of over one billion. Reducing food wastes is not a simple thing to do. It could take years for India to build stronger and more

efficient roads and it could be very hard to find investors for better storage facilities; however, the problem is clear and the solutions are possible. All we need to solve the problem is action.

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