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India, Factor 20: Farm to Market

### **India: Limiting Food Waste by Improving the Quality and Capacity of Existing Storage Facilities**

India—the lush, tropical nation situated prominently in Southern Asia—is the epitome of the resource curse. Farmers across India have record harvests each year as millions of Indians remain malnourished. The situation is fueled by inefficiencies in government and third party farm to market systems, which handle food before it reaches the consumer. Food waste in the systems allows people to go hungry in a nation that produces enough food to sustain its entire population. The lack of adequate physical housing, from grain silos to cold storage centers, leads to the waste of basic crops, which feed most of India's poor. Businesses and the government of India lacked preparation and failed to forecast the rapid growth of harvests in recent years, and both will continue to be unprepared to handle larger amounts of food. The government, which supports many local food subsidy programs, buys large amounts of food from farmers, yet has no appropriate way to store all the purchased food, allowing it to spoil. Meanwhile, businesses with commercial interests give cash crops the priority for cold storage over crops which are a necessity for the poor and rural. Fortunately, the problem does not reach beyond basic infrastructure needs. Simple improvements in food housing and giving priority to crops which sustain the majority of the population—the poor—are two simple ways to start tackling the malnutrition situation in India. Fixing the problem will be direct; the problem lies within physical and organizational inefficiencies in middle man processes between the farm and consumer.

Half of the 1.2 billion Indians in India work in agriculture (Artiuch and Kornstein). But, the farms that they work on are miniscule—a result of the practice of splitting land amongst children from generation to generation. Farms average around 5 acres in size, meaning that the average size of a farm has gone down by 50 percent since India's independence in 1947 (Westhead). The small size of each plot, along with the inherent risks in India's produce sector, makes the incomes of crop growers variable and low. Income can shift on a daily basis because of the supply and demand of the day, rather than seasonal or annual trends (Artiuch and Kornstein). Often, a farmer will only have a few dollars to spend on food in a week. The farmer has to provide for his or her entire family as well; families on farms tend to consist of three generations through the father's side, though this trend is declining in some parts of India. The 2011 census of India shows that 47.1% of rural families have less than 4 members, and that 47.6 % of families in all of India have 5-8 members.

70% percent of those who live in rural areas are illiterate and the problem continues to worsen. According to the Unesco Education For All (EFA) program, 126 million children and adolescents in India do not receive schooling, and aid to education fell over 270 million dollars to levels not seen in years. But the government of India has mandated that education for those aged 6-14 be free, thereby giving more children access to education. Upward trends in services, such as health care, are helping the portion of people in India who live in rural areas find more access to public and private health care systems. This allows more of the population to receive treatment for diseases which are curable. Health care is mostly done through private companies rather than through the government in India.

Farms in India continue to produce crops that have been part of Indian diets for centuries. Vegetables, such as peas, potatoes, tomatoes, and onions are grown along with grains, fruits, seeds, and pulses. Vegetarian and non-vegetarian diets are influenced by local culture, and the most common crops are wheat and rice. The south of India eats a more rice-based diet while the north incorporates wheat into their diet. Wheat and rice are grown in the millions of tons, and India has become the second largest

producer of wheat in the world. In 2013, India harvested a record 93.4 million metric tons of wheat (Mishra and Parija).

Wheat takes a special role; the Indian government buys wheat to stockpile for emergencies and intends to distribute it to the poor through food subsidy programs. The government buys and stores wheat through the Food Corporation of India (FCI). But in recent years, the strain on grain storage facilities has grown past the tipping point and the FCI receives more wheat each year than they can store (Pasricha). In 2012, the FCI had the storage capacity for 63 million tons of grain, but was given 75 million tons of wheat to handle. The existing network of storage is of poor quality as well. Graduate students of the Massachusetts Institute of Technology Paul Artiuch and Sam Kornstein describe the storage as “20 foot stacks of 50kg burlap sacks sitting in parking lots and covered with plastic tarps to keep out the rain. Most facilities are open air and offer no protection from humidity, birds or pests—common food waste causes. In many cases, the tarps don’t even fully cover the grain”. In recent years, up to 20% of the stored grain would be lost (Artiuch and Kornstein). In 2010, 16 million tons of grain went to waste, which is enough to feed 181 million Indians for an entire year. The government failed to account forecasts of increasing production and the rampant food wastage lead to large financial losses. The FCI lost 1.6 billion rupees or around 26.5 million US dollars in 2012. Deficits continue to increase this way, financial pressure is added, and the cycle continues as it becomes even harder to spend more to fix the problem.

So while agricultural productivity rises, malnutrition begins to devastate more Indians than ever. 21% of Indians are malnourished, including 40% of all children (Westhead). Rates of malnutrition in the country have gone far past its comparable neighbor China, and are even higher than countries in the sub-Saharan region. Failing infrastructure and massive waste incurred from the lack of basic food housing are the main sources of the problem.

The amount of grain wasted in India amounts to the quantity of grain produced in all of Australia (Westhead). But grain was not the only product to be wasted by lack of basic infrastructure. Potatoes, tomatoes, and onions are all foods that are common in many Indian diets and are prone to rotting quickly. The lack of cold storage causes a multitude of problems; both nutrition and farmer income are affected. Cold storage helps fruit and vegetables last beyond their week long shelf life. If they are not sold within the time period, they begin to rot, and become inedible. The rotten produce is often cast into the streets or given to street animals. And, the lack of cold storage causes similar financial problems as the wheat situation.

Cold storage can help maintain the quality of fruits and vegetables for a longer time period, especially advantageous when produce prices are at a low period. Preserving the produce for sale at a later date can assist in keeping prices static. Otherwise, prices are at the mercy of random trends and seasons. Farmer incomes, which are constantly shifting due to changing food prices, can maintain stability. This will relieve pressure on the financial situation of farmers. In addition, families across India gain access to fundamental blocks of a proper diet. Fruits and vegetables are needed to maintain overall health, reduce disease risks, and are great sources of energy. Risk from diabetes to heart and bone disease is lowered by fruit and vegetable intake. Potatoes, tomatoes, and onions, squandered through lack of cold storage, contain vital vitamins and nutrients. The lack of basic infrastructure affects both the nutrition of Indians and incomes of crop growers.

For India, the gravity of the malnourishment problem is compounded by the incredibly high population of the country. The food demand and production are on a larger scale than most other countries. In India, over 200 million people are malnourished (Pasricha). Most of India’s poor live in rural areas, where malnutrition is most common. The most basic of food ingredients, from fruit to vegetables to wheat products, are wasted through simple, curable failures in the food storage and maintenance process both by the government and the middlemen of the farm to market process. The rural suffer most, as staple crops

makes up their entire diet. Income fluctuations make it hard for families to purchase any food outside the most basic and required intake. Therefore; the loss of produce causes dramatic problems for the poor and those who live in rural areas.

India's explosive population growth adds urgency to the situation. The population growth is a unique factor that adds ever increasing pressure to fix the situation immediately. Current infrastructure is already unable to provide income stability and adequate nourishment for all. As the population continues to grow, India must act immediately in order to provide a food infrastructure for future generations. India already has a massive population base, and according to the United Nations (UN), is expected to become the world's most populous country in the world by 2028 (Times of India). Malnourishment and income instability will continue to rapidly grow as a problem with India's population growth. It will become more of a challenge, and will put more people in danger of starvation and poverty if India delays tackling the problem further.

The starvation affects one group the most—children. Four out of ten children in India are malnourished. Consequentially, these children are severely underweight, have learning and memory disabilities, and are prone to illness. The plight of these children is a humanitarian crisis that will have many negative effects on the next generation of citizens.

The Indian government has attempted to improve the situation. The passing of legislature through the government can be seen as a good sign of acknowledgment of the crisis. One bill, the Food Security Bill, is an attempt to start solving some of the issues causing malnourishment. Though it is cited for being costly and time consuming, it shows that the government is trying to act. Malnourishment has been in media spotlight and the Indian government and the people know the responsibility they have to improve the situation. Awareness of the problem, both within and outside of the country, can be used as a sign to indicate how the situation might improve. With greater awareness, there will be more pressure on the government to fix its grain storage problems and on the individuals/businesses.

India has enough food to feed its entire population (North), and though the country imports food products, it will be over a decade from now before imports are a requirement. Millions of tons of wheat and rice are produced, and a variety of fruits and vegetables are grown across India. The problem continues to be a game of connect the dots; millions still remain malnourished. If there is more than enough food to feed the entire population, then the solution for the malnutrition problem requires a fix for both government and third-party storage. Preventing losses, logically, puts more food into the system. The FCI receives more input grain than it can handle. Even with its status as a leader in wheat production India has a grand total of 20 grain silos, which is miniscule compared to the 400 in Canada (Westhead). Grain silos are a cheap investment, in comparison to large scale government programs. Construction of a full-size, industrial grain silo typically costs less than a hundred thousand US dollars (Farmgate). Physically, the structures only require land, are environmentally safe, and provide all around shelter. This not only gives a designated space for storage but keeps the weather and animals out. Grain silos have optimal designs for grain storage. And even with the costs of facility construction, maintenance, aeration electricity usage, and wheat transfer, additional silos will be a quicker, cheaper, and straight-forward alternative to government programs for wheat. Fruits and vegetables face a similar problem; in their case, cold storage. Fruits and vegetables, with potatoes, onions, and tomatoes being especially common, are highly perishable. If these fruits and vegetables are not sold within the time period, natural changes and bacteria promote rotting within the fruit or vegetable, making it inedible or dangerous to eat. These products are thrown away, wasting food, time and money. If the market is not right at the time for a specific crop, the farmers have no other choice but put the crop up for sale anyhow, also due to the lack of cold storage. Improving cold storage networks in the private sector, since most produce goes through private companies, can solve both wastage and prices. Cold storage increases the longevity of produce by slowing down the degeneration of the live material which makes up fruits and vegetables. The waste,

naturally, will go down with a larger network of cooling centers. Lowering the waste from inefficient infrastructure will be extremely effective in fighting malnourishment. Though cooling centers can be expensive to maintain, the government has previously stepped to subsidize cooling technology, making it easier for staple crops to be sold and generate overall profit, like cash crops. Making government-subsidized cold storage a long term initiative will be very effective in keeping core foods on the shelves instead of in the trash.

While changing storage systems and creating new storage will have beneficial, long-lasting effects on the food market and farmer-income, there are ways to create immediate, short term security in both these areas. An example is the Vegetable and Fruit Produce Council Kerala (VFPCCK)—an existing and effective program designed to achieve income stability and efficiently bring food to the market. The group, based in the south Indian state of Kerala, has created over 8,000 self-help groups among farmers. The VFPCCK has created 254 new markets in the region—markets which are farmer-oriented to allow the farmer to receive a larger share of the profits. Produce is even processed and marketed through the council, and the group gathers price data for various fruits in various centers and areas in the country in order to make better financial decisions. The council helped sell 101156 metric tons of local produce from 2012 to 2013. The fact that all aspects of farm to market process are handled under the same group allows for improved efficiency at a local level.

The VFPCCK is a strong example of an effective model for selling produce. However, scaling this particular model up to a national level would be difficult. The produce of Kerala is much different from the crops grown in the north of India, and it would be a financially impossible for one single council to handle all the food processing in India. A better way to apply the VFPCCK's model is to take certain aspects of it, as in collecting data, handling food processing, crop marketing, and apply it to existing state organizations. Once the government and third-party businesses revamp their storage systems, it will become easier for a variety of produce to be sold through the normal middle man method, as the government and businesses have many more markets available. Therefore; short term fixes to state-wide programs can improve regional efficiency while the national system, which can distribute produce nationally, is being updated.

Smallholder farmers would benefit immensely with the broadening of cold storage across India. In the status quo, farmers who cultivate perishable produce have to sell their food to middlemen who sell immediately because the produce will rot quickly. Prices for produce can shift drastically, so the price the farmer sells the produce at can be very different at times. The income the farmer makes off of the produce is variable under these circumstances. To increase cold storage networks would mean extended shelf lives of produce. This allows farmers and middlemen together to sell the produce to markets at an optimal time. Produce will be sold at a better, consistent price. Smallholder farmer incomes will stabilize and alleviate nutritional and financial problems. The market will grow and the economy of the agricultural sector will grow with the introduction of cold storage, since a majority of India's farmland is held by smallholder farmers. Overall stability in the sector can lead to improved production and investment on the farm. The picture could drastically change from farmers who can barely feed themselves and their family to farmers being able to put money into their farms for increasing production.

The two main figures in solving food wastes and income instability are the national government and third party groups involved in between the farmer and the marketplace. The national government decided to take on the responsibility of maintaining emergency stores of grain and wants to distribute food to the poor through its nation-wide programs. Though it had good intentions, the FCI, which was to manage the stored grain, did not have the resources to properly store collected grain leading to large food wastes, which were enough to feed millions of people, and faced large financial consequences. The private sector is also burdened with the blame for the problem. Commercially driven motives allowed staple crops to go to waste as cash crops were given priority. The decisions affected millions and put many more at risk.

Fortunately, solving the problem requires little more than small investments and regulations. The costs of adding all the necessary infrastructure, housing and preservation, will amount to less than the cost of current programs designed to combat malnourishment and other difficulties. Since the government has cordoned off money for the programs, the money to add infrastructure is already there. The rural and smallholder farmers can take roles as well, acting as indications of the success of additional infrastructure.

The people of India can always add pressure to the Indian government to take action and solve the problem as quickly as possible. Currently, the media has put the spotlight on the hunger crisis and spreading awareness of the effects of malnutrition. Individual citizens can do the same—by spreading awareness in where they live. Also, the individual has a large role in influencing the government in passing legislation. The power of ordinary citizens could be seen when people underscored that India cannot have ambitions to be a global leader with its notorious malnutrition and poverty. Because of this, the newly elected majority party stated that “extreme poverty and malnutrition will be a national priority” now (Rao). As for private businesses, Veena S. Rao, a former secretary to the Indian Government, states that the people “must motivate [businesses] to assume some responsibility” for the malnutrition situation.

In the 1940s, farmers in the province of Gujarat in India, fed up with income instability, decided to try and stabilize the prices on one of their most produced products—milk. The project, known as Anand Milk Union Limited, or Amul, banded milk producers to create local networks that would help farmers selling milk get the best price for their sales while attempting to give customers the best price for the product. The income instability of the milk producers stemmed from a complicated middle man process which farmers could not circumvent. This, coupled with milk’s tendency to spoil in the hot and humid climate of India, caused prices to collapse often. The Amul organization, which was run by the milk farmers themselves, would buy fixed quantity and quality milk regardless of circumstances. But the Amul organization operated at the local level, giving it the advantage over the current, complicated middle man buying process. Milk could be sold quickly, lowering prices for consumers, and locally using this more streamlined process. Surplus milk was then held by Amul, to be distributed at the national level.

Eventually, the dairy industry of India was changed completely by Amul. The local organization was drawn up from local branches to the largest food company in India. Maintaining the same values and same method, the corporation sold milk and milk products for lower prices all across India in local groups. Now, the same problems that plagued milk producers in the seventy years ago, affects all farmers from vegetables to wheat. The origins of Amul can be compared with the existing state of the VFPCCK today—improving the farm to market process at the regional level.

It can be acknowledged that there is no measurement that can give a perfect forecast on how much will be harvested per year. The same can also be said for rates of population growth in the country. Inaccurate forecasting has been, and continues to be, a barrier for the Indian government and other businesses in reforming the farm to market process. Like most countries, India performs a census of its population, and India creates estimates for the upcoming year’s harvests and produce. But optimizing storage systems requires finding the perfect balance between predicted growth of harvests, population growth, and costs of storage construction. This means that the Indian government should be gathering more in-depth data about its population and agriculture. Qualitative analysis and finding trends in both these fields will provide more value than flat statistics when planning storage system expansions.

The problem with India’s food system lies simply within the process that gets food from the farm to the consumers. Before food grown by farmers makes it to the market, the food travels through many middle men, including the government of India and many businesses. Businesses store and transport food to various markets, but tend to have limited cold storage space for the crops that make up foundations in the diets of the poor and rural. The crops, mostly fruits and vegetables, will go bad without adequate cold storage networks. The government of India was unprepared for the extreme growth in the harvests of

certain foods such as wheat. Their food subsidizing programs ended up wasting enough food to feed millions more of their population. The food was wasted by lack of proper, long-term storage centers which exposed the food, like wheat, to the elements and animals. Although the food waste is rampant and extremely large, fixing the problem is straightforward in both cases. The government can construct more industrial silos; the problem of food waste lies solely in FCI's incapability to handle larger harvests. Business should adapt methods in which food can be distributed locally, which is more efficient in terms of cold storage use. These fixes will be a strong foundation in the fight against chronic malnutrition across India. In addition, farmer incomes can stabilize, reducing financial strain on families. These steps will be the start of the changes needed to ensure everyone consistent access to foods that are critical in the fight against malnutrition.

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