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Bangladesh, Factor 8: Spoilage and Waste

### **Improving Food Security in Bangladesh**

Food insecurity is a significant issue in the world. Thirteen point one percent of the world's population falls into the category of food insecure. Roughly 925 million people go undernourished on a daily basis. Ninety-eight percent of food insecurity is in developing countries (Wright). By 2050 the world's populations will increase from seven billion people to nine billion people. In order to feed more people currently, as well as meet this growth in population, we must develop new strategies to raise the amount of food produced and the way it is stored and distributed by the world.

Bangladesh is located in South Asia, bordered by India to the north, the Bay of Bengal to the east and west, and Myanmar to the south. The name Bangladesh means Bengal nation. It is the eighth most populated country in the world. Roughly the size of Iowa and populated by 2,600 people per square mile, Bangladesh is one of the most crowded countries in the world. Poverty is widespread and the country's gross domestic product (GDP) per capita is \$1,800; almost half of all Bangladeshis live on less than one dollar a day. The life expectancy is 59 years and only 43% of the population is literate (National Geographic).

Bangladesh is in a challenging situation in regard to agriculture and food for its people. Due to many factors, Bangladesh does not have the means to adequately meet the food demand for its population. Natural disasters, such as floods and cyclones, have a large impact on food insecurity. Pests and inadequate storage techniques also greatly impact food insecurity. This causes the government to spend significant resources on importing food, but these resources could be used in other ways to benefit the country. The problem with food insecurity begins in rural farm households (National Geographic).

Agriculture accounts for 31.6% of Bangladesh's annual GDP, with rice being the most common crop. Rice occupies 72.85% of the total crop area. Other crops include wheat, other cereals, pulses, oil seeds, fibre crop, sugar crops, fruits, vegetables, potato, sweet potato, spices and condiments, coconut, betel leaf, and tea. There are 17.83 million rural households in Bangladesh and 11.80 million of these are farm households (Robbani 17-18). The average rural household size in Bangladesh is 4.4 persons per family and it typically consists of a mother, father, and 2-3 children (Kulkarni). The occupation of agriculture makes up forty seven percent of the labor force in Bangladesh (Central Intelligence Agency). The average farm size is 2.268 acres (Ahmed).

Farmers in Bangladesh use low-input farming. They add bits of fertilizer where they can, with nitrogen being added to the exclusion of the other fertilizers. The organic matter in soils of Bangladesh is about 1.5% or less with the exception of few areas. Due to the lack of fuel, farmers must burn crop residues and up to 80% of their cow dung. This wastes nutrients that could have been added to the soil to maintain fertility. Almost all the upland soils of Bangladesh are deficient in nitrogen. Low-input rice farming systems in Bangladesh rely substantially on returns of organic matter and biological nitrogen fixation from blue-green algae to maintain their level of fertility (Hossain, et al.).

Total demand for grains in Bangladesh is 16.5 million tons while production is 15.2 million tons with a net production of 13.7 million tons. The 1.5 million tons lost is mostly due to pests and spoilage. This food deficit overall is 2.8 million tons. This shortfall is lessened by government imports such as food aid, purchases, grants etc. (Islam and Dey).

Rice is the most abundant crop in Bangladesh consequently; nearly two-thirds of the daily diet consists of rice. Vegetables are also eaten along with some pulses and small quantities of fish when it is available. Milk and meat products are only eaten occasionally in small amounts. The amount of fruit consumed depends on the season and mainly consists of papaya and banana. Cooking oil and fat in general, is rarely used. In addition, cultural norms permit the man of the house to have the first pick of food and he is allowed the most food. Due to this custom, children and women in Bangladesh suffer from high levels of malnutrition and micronutrient deficiencies. Low birth weight, under-nutrition, vitamin A deficiency, iodine-deficiency disorders, and iron-deficiency anemia are all effects of this. Anemia is a severe public health problem affecting pre-school children (49%) and pregnant women (47%). It is also a moderate public health problem among non-pregnant women (33%) and adolescents (29%). Anemia is caused by iron deficiency and it impairs the growth and learning ability of children. It also lowers resistance to infectious diseases and increases the risk of maternal death and low birth weight. The food eaten by the people of Bangladesh not only lacks in nutritional value, but it is often prepared in ways that result in a loss of even more nutrients, such as washing and boiling vegetables and rice. There is also a lack of protein rich and micro-nutritious foods such as meat, eggs, milk products, fats and oils. These foods typically only make up 10 percent of a rural person's diet. People in Bangladesh get about 123 grams of fruit and vegetables daily, 89 grams of which come from non-leafy vegetables. The suggested number of grams of fruits and vegetables recommended by FAO and the World Health Organization (WHO) is 400g daily. Overall, the diet of rural Bangladesh is not healthy or balanced (Nandi).

Education and health care are both issues that have been detrimental to agriculture in Bangladesh. Often rural families are at a disadvantage due to lower income. Rural people often do not have professional degrees, putting them at lower status in society (Harris). The percentage of people above the age of 15 who can read is only 57.7% (Central Intelligence Agency). Also, the people in rural areas of Bangladesh are often not well educated on proper farming techniques. They are at a disadvantage in terms of access to healthcare because they do not have the opportunity to see professional physicians and many times they must find a non-professional doctor who is unfamiliar with modern remedies (Harris).

There are a variety of other significant factors holding Bangladesh back from improving agricultural productivity and gaining access to adequate nutrition. One of the factors is flooding which occurs almost yearly. Another factor is lack of knowledge about the nutritional value of agricultural products such as fruits and vegetables. Also, synthetic fertilizer used by farmers in Bangladesh causes the degradation of soil and is especially detrimental to the organic matter in it. There is also a lack of women involved in agriculture mainly due to traditional beliefs, so farming is limited to only the attention of men. A very large factor holding Bangladesh back from making advancements in agriculture is the fact that nearly half of all potential food crops in the country suffer pre and post harvest losses mainly due to pests and a lack of good storage and transportation. There are three seasons when rice has the ability to be produced, Aus, Aman and Boro. During Aus, the rice is sown in March-April, then harvested in June-July. In Aman, rice is sown in July- August and harvested during November- December, and in Boro, the rice is sown in December- January and harvested in May- June. Studies have shown that the highest insect and pest infestation issues are during Aus, with the highest number of problems taking place during Aman. Fifty-eight percent of farmers use pesticides depending on the degree of infestation. It is estimated that 4000 metric tons of insecticides are being used annually, including banned products such as DDT, endrin, BHC, aldrin, dieldrin, heptachlore, and also some over-toxic Indian items like thiodin. There are no effective constraints on types of pesticides that are used, nor pesticides that are imported into the country. Many pesticides manufactured by local, unauthorized companies have been reported to pollute soils and waters leading to the destruction of aquatic life and damaging the food chain. The majority of farmers also use extremely unsafe disposal methods for unused pesticides. In addition, insecticides being sprayed several times a week have made vegetables more resistant to pesticides which increases the chance for people to eat vegetables with pesticide residue on them. Further, the overuse of pesticide has decreased the number of pollinators, predators, and other friendly insects while increasing the resistance to

pesticides of harmful insects. Outbreaks of secondary pests have also been encountered (Robbani 19-22). Many of these pesticides are used to make up for bad storage techniques in which harvested crops are attacked by pests. Without the losses due to dated, traditional methods of storing food, Bangladesh would have nearly enough food to feed its people and would have to import less. There are many significant issues that are a detriment to the agricultural productivity of Bangladesh.

A very important factor that negatively impacts food security in Bangladesh is spoilage and waste. This factor plays a role in the typical subsistence farm family since the food that is produced and not stored properly, causes a significant percentage that could have been used to be wasted. Rural farmers lack funds, which keeps them from using more advanced equipment for storage, which creates higher post-harvest losses. By losing so much post-harvest, the farmers have an even lower income. With so many of Bangladesh's population being subsistent farmers, this makes a significant impact on the country. The Department of Food assumes that the approximate rate of losses occurring annually is at about 58%. World Food Program (WFP) estimates that the rate in which rice is lost is constant at about 8% per month throughout the year. Wheat is estimated to be lost at a rate of .6-8% in the months of July through February, and 1.3- 2.0% in the months of March through June. These losses occur due to pest damage, transport loss, handling loss and losses due to long term storage. The grain loss in post harvest occurs mainly during the storage period. Many experts believe that there is a 35% loss due to storage on the farm. Annual rice production is about six million metric tons and thirteen to eighteen percent of this, is handled by the government or merchants while the rest stays stored at the farm. There is at the time, no involvement of the private sector in storage of government handled food but about 85% of grain is being handled by the private sector under traditional systems. These traditional food storage systems include earthen vessels made of burnt clay or mud, mud bins made of unburnt clay mixed with long bits of straw or grass for tough consistency, kerosene tins which are made of tin, and gunny bags made from jute fibre. Also, bins used in traditional storage methods can be made out of bamboo matting or matting of the stem of *Saccharum arundinaceum*. Pucca godowns are common as well. These are brick built structures with tin roofing (Islam and Dey). The use of these traditional storage practices and the use of out of date storage facilities are detrimental to Bangladesh's overall food security by increasing post-harvest losses. These facilities are very susceptible to both pests and the outside environment.

Domestic food production has an important role to play for food security in Bangladesh. Although the acreage of foodgrain production has shrunk, the production of foodgrain has been on the rise due to increases in per acre yield and better management of post-harvest losses. Studies by Bangladesh Agricultural University have shown that since 1971 Bangladesh's agricultural industry has gone up and down, but overall it has improved. Grams of food grain available daily per person have increased from 367.60g in 1973 to 535.89g in 2008, potatoes have increased from 25.04g to 73.70g, vegetables have increased from 38.98g to 53.97g, milk has increased from 31.95g to 44.38g, and eggs have gone from 1.83g to 3.56g during the same time period. Grams of meat (9.31g per person daily in 1973 to 9.86g in 2008) and fish (31.07g to 40.82g) have also increased. The only decreases in grams of food available daily per person since 1973 are pulses (15.07g to 13.15g), and fruit (48.15g to 40.82g) which have decreased dramatically. All of these statistics have been recorded according to studies done by Bangladesh Agricultural University. Bangladesh is making improvement in food yields, but it is not keeping up with its growing population which will create more food insecurity. The projected production growth of rice, Bangladesh's most abundant crop, is 2.30% from 2005 to 2021. The projected consumption growth is 2.59%. This puts the supply-demand gap at -0.29%. The projected growth of wheat production is 3.80% while the projected consumption growth is 5.56%. This supply-demand gap is -1.76%. These predictions have been made according to research done by Bangladesh Agricultural University and these projected needs will cause Bangladesh to have to import even more food in the future. This will be a detriment to Bangladesh's economy, further worsening the current situation subsistent farmers face (D'Haese and Begum).

Farmers' attitudes toward storage and the long term value of the investment in storage technology needs to change. The waste of food is partly due to farmers' priorities. They may not see storage as a beneficial investment for their limited funds and therefore will not be looking for more advanced ways to conserve and process food. This is why there is such a lack of storage in Bangladesh and why there are few efforts to increase storage technology and reduce waste. Rural farmers have very little money to spend and are often heavily in debt. They cannot invest in storage systems, so much of their crops are wasted. Reducing this waste by providing low-cost means of storing food will increase the amount of food in Bangladesh and increase farmers' incomes (MIT).

Improving the current food storage conditions in Bangladesh would overall improve the country. It would cut down on food insecurity, boost the economy, reduce poverty and benefit smallholder farmers. Total loss due to post-harvest processing, mainly storage of agricultural products in Bangladesh, is tremendously high. In 1990, post-harvest losses totaled more than 503 million dollars. Since then, the amount lost yearly has increased by 77.9 million dollars in 2000. Ten to fifteen percent of durable crops such as cereals and pulses are lost yearly, 15-30% of semi-perishable crops such as potato and onion are lost post-harvest yearly, and 25-40% of perishable crops such as fruits and vegetables are lost. These are large percentages, especially considering they reflect post-harvest losses. This does not just lead to economic problems, but problems with malnutrition and socioeconomics. Both the government and private sector need to invest more effort in research and extension towards improving and modernizing post-harvest facilities. Improving these facilities would reduce the 2.8 million tons of food imported to feed people, leaving more money for other things which would benefit the economy. Also, smallholder farmers would gain more income, because they would have more crops to sell. The large percentage of fruits and vegetables being lost indicates that there is room for improvement just by using better storage techniques. Having more fruits and vegetables available to the people of Bangladesh would greatly improve the current malnutrition problem (Baqui). Bangladesh is affected by yearly floods, rats and other pests, and a population growth rate which is increasing faster than the rate of food production, so something must be done to decrease food insecurity in the country. It seems a logical first step that would have a significant impact on food security would be to work on improving current storage facilities. This would help make up for crop loss during floods, protect harvested crops from rats and other pests (which alone, account for 12-13% loss in crops post harvest) and increase the amount of food produced in order to combat the population growth rate (Grolleaud).

An effective way to reduce the amount of food lost post-harvest in Bangladesh would be to use household metal silos. This post harvest technology has already proved successful in sixteen different countries. Benefits of this strategy include: the silos are airtight, they maintain the quality of stored food, avoid the use of insecticides, and prevent rodents from getting in, which is detrimental to consumer health. The silos have the potential to reduce storage losses to nearly nothing as long as moisture is reduced to less than 14%. This level of moisture reduction can be achieved by using solar dryers. These decentralized silos require little space and can be placed near the home. An average 1,000 kg silo would allow enough grain storage to feed a family of five for a full year. Farmers' income would be increased because they would be enabled to save more grain and to sell grain when it is scarce and more expensive. These storage silos could also be built with local labor, and they could be made with readily available materials. An average silo typically costs around \$130. This expense can be met with a small down- payment and the rest paid over time. The money generated by this technology, enabling the farmers to sell crops in the off season, will make it so that the farmers can make their payments. Fifty-nine percent of farmers in other needy areas, who have begun using metal silos such as the ones proposed, thought they were inexpensive, and ninety-six percent say they have found them very useful (Delle). This particular technology would be a good fit for Bangladesh as it is very effective in it's results and the subsistence farmers in Bangladesh possess the ability to use this technology correctly with the proper education on how to use it.

Agricultural technicians and trained craftsmen will be needed to teach locals how to properly use this new storage technology and how to make silos for themselves. Building a silo requires galvanized sheeting of 100x200cm and 0.5mm thick and simple tools which can be supplied by the United Nations, and NGOs including the Food and Agriculture Organization, the South-South commission, and the European Commission. The silo, with its contents, should be placed in an area protected from sun and rain. Workshops teaching farmers how to build silos and maintain stored crops should be held by agricultural technicians and trained craftsmen. The workshops would last one or two weeks. In-depth instructions made by the Food and Agricultural Organization (FAO) on correct use of silos would be distributed. For illiterate farmers, videos will be shown to supplement the guide book pictures. The first group trained will be a group of post-harvest professionals and technicians from the National Agricultural Institution. This group would then be encouraged to share their knowledge with subsistence farmers around the country who will in turn be able to teach their peers (Delle).

Implementing this strategy starts with acquiring the funds necessary to purchase the materials required to build these silos, as well as the funds necessary to transport the materials. A large percentage of the cost of these could come from FAO's TeleFood Campaign. This campaign has already raised more than 9 million dollars for various projects supporting food security in more than 100 countries. The money is donated from people all over the world who are interested in making a difference in ensuring food security. The TeleFood Campaign has already been involved in implementing household food storage solutions in many developing countries. Mr. Peric, the local manager of an FAO post-harvest project and two TeleFood projects in the Department of Potosi, says, "It is amazing to see the immense impact that simple technologies can have on the daily life of the farmers. We can already see development in the communities where a lot of the families have individual silos for their grain. There the children tend to get sick less, and nutrition is improving" (Robinson). While TeleFood will pay for most of the materials, it will not pay for the labor. The labor would need to come from locals, trained by their peers (FAO). Other organizations that have helped in the past with implementing storage techniques such as metallic silos are the South-South commission and the European Commission. The ACF International's Action Against Hunger campaign has helped with many disasters in the past including ones in Bangladesh and is committed to reducing food insecurity. A good next step for them in helping combat food insecurity in Bangladesh would be to have them help with teaching the rural farmers of Bangladesh proper use of these metal silos and helping distribute these metal silos to communities (ACF International). Judging by the rate at which these storage technologies have been implemented in other countries, in a five-year period, it would be possible to have this type of storage in over 17,000 houses (Robinson).

Bangladesh has been tasked with several Millennium Development Goals to be achieved by 2015. Many of these already improving goals including; eradicating extreme hunger and poverty, reducing child mortality, and improving maternal health can be significantly bettered by increasing the amount of food available to farmers through post harvest loss improvement. Eradicating extreme hunger and poverty can be improved by the use of metal silos, which would increase the amount of food available to be used during non-harvesting seasons for either consumption or to be sold at a higher price. It will improve child mortality and maternal health by helping children and mothers receive adequate nutrients to remain healthy (United Nations Development Programme).

Food insecurity is a worldwide problem. Overall it stems from many different reasons in developing countries. It is not something that can be stopped by one plan or project. It takes many small projects each making a difference, to provide nutrients to the whole world. We must improve food security one step at a time. Taking these steps will slowly but surely help the world toward food security and a better outlook for us all.

Bangladesh has room for improvement in agriculture in order to advance the country's level of food security. Bangladesh's ability to feed its population could greatly increase if post-harvest storage practices

were improved and executed in a more modern way. Household metal silos are the answer to feeding people effectively in Bangladesh. This type of storage technology would cut down on the large percentage of crops lost to traditional storing techniques. If used properly, the metal silo could cut losses to zero and could supply enough storage to feed a family of five for a full year. Excess crops could be sold at times of the year when they are scarce in order for farmers to fetch a higher price and increase their income. Metal storage silos are inexpensive, easy to build, simple to use and very convenient. Most all farmers in developing countries who have been allowed to use this technology have reported that it has helped them. Bangladesh is a prime candidate for this technology to be implemented. It would provide a significant overall benefit to this developing country by cutting down on food insecurity, poverty, spoilage and waste at the same time. Bangladesh is a great example of a country that has a high potential for success in providing food for its population with a little help from a more modern and efficient approach to post-harvest storage. Taking steps to help farmers in Bangladesh store their post-harvest crops would put the country on its way to food security for a vast majority of its people. Every small step counts toward the final goal of a food secure world.

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