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### **Bangladesh: Land Devastation**

Food security is a significant concern to countries in the Indian Subcontinent. Bangladesh is one of the poorest and most densely populated countries in the world. The staple foods of Bangladesh are rice and fish, and the people of Bangladesh are commonly referred to as 'Macche-Bhate Bangali' (i.e., the people made of fish and rice). Rice is the foremost agricultural crop in Bangladesh and annual fish production is significant. The demand for rice and fish is constantly increasing in Bangladesh with nearly three million people being added each year to the population of the country. This research will focus on the needs and actions of citizens to respond to climate change by: adapting agricultural practices; creating policies to increase carbon sequestration; supporting ecological resilience to erratic weather, rising temperatures/drought; and shifting plant disease transmission/pest infestations.

Compared to the state of Iowa, Bangladesh faces increased food security challenges in the future. Though Bangladesh is roughly half the geographical area of Iowa the population density is approximately 50 times larger than Iowa. Bangladesh has a population density of nearly 1,000 people per square hectare, whereas, Iowa has a population density of approximately 21 people per square hectare. Iowa has approximately 36 million acres of tillable land and Bangladesh has approximately 19.76 million acres of arable land. Nearly 85 percent of Bangladesh lies on a floodplain. Unlike Iowa, food security will be a much greater concern if/when climate change advances.

Local economies in Bangladesh struggle because the country has both a high export rate and a high import rate of other food products. Bangladesh does not appear to produce enough to feed themselves while exporting as much as they do. Integrated rice-fish farming offers a potential solution to this problem by contributing to food, income, and nutrition. Unfortunately, this alternative source of food security may also be negatively impacted by climate change.

Bangladesh's predominantly agriculture-based economy is easily challenged by potential damage from natural disasters. One major natural disaster could severely damage their economy and ability to secure food. Much of Bangladesh is one to two meters above sea level or in some parts below the rising water levels. Increased sea levels will destroy much of the country. Anticipated sea-level rise may be a huge natural disaster which would submerge one million hectares of agricultural land in Bangladesh. This would be equivalent to 2.47 million acres, one fifth of Iowa or 20 counties. If much of the country is submerged in water, how will they produce food and where will the population go?

Increased water flow from the Himalayan glaciers is eroding soils from the north and depositing silt in the delta in the south. As soils erode people may have to move to another country or to the northern part of the country, but the increase in population density may be unmanageable. Eroded soils that are deposited in the delta will be of little value as surrounding waters rise and become salty. As glaciers melt and sea-level rises, more salt water is mixed with the fresh water. This will cause decreased yields in crop, and many will not be able to afford the food they produce locally, and they will have to import more food than they did before.

More people and less food can only have one ending; it won't be peaceful and may be violence. There may also be attempts to migrate into bordering countries that might not be willing to let immigrants enter. Eroding soils which decreases tillable could be deadly to the population of Bangladesh. Human nature is

to stay alive at any cost, and people will do almost anything to live which may result in violence. Effects of climate change caused largely by more developed countries will likely impact Bangladesh first.

Bangladesh exports more food than they keep for themselves. A major source of food comes from importing from other countries. So they really aren't doing much to help the local economy. Many people find it cheaper to import their food rather than buy within Bangladesh. The most important product that they produce in Bangladesh is rice and because that they can't find places to export it largely goes toward feeding the country. The problem with this is that the land is rapidly changing with the water levels rising more salt water is getting into the rice fields and make the yields drop. Decreased farmer income will negatively impact the farmers' ability to secure food. They have to buy fewer crops for the next planting season. Additionally, rice does not provide adequate protein and a complete balance of nutrients.

The farmer also has the option of using micro-credit. Lenders charge interest on the money loaned and it is almost like a trap that borrowers often can't repay. People take a loan out intending to start up a business, but the company expects the money before they earn adequate profits. Improving education is essential to helping citizens manage their resources wisely and profitably. Increasing the use of floating schools may prove to be a better investment in their future by increasing the education of young people.

20 percent of the rural population in Bangladesh lives in extreme poverty. These households own no land or other assets. Many are illiterate and suffer from continual food insecurity. Those living in extreme poverty may be disabled or suffer from chronic illness. 29 percent of the rural population is considered moderately poor. Farmers who are moderately poor may have a small plot of land and may have some livestock. These small, subsistence farmers may have enough to eat but their diets are still lacking. Their diets often lack adequate protein and other essential nutrients. While more secure than those living in extreme poverty, Bangladesh farmers face threats of severe weather variations, crop injury or crop failure.

Improper use of pesticides is a significant problem. As flooding and erosion occurs, pesticides spread and the high amount of illegal pesticides used damages the land to a point where it can't be fixed. The increased contamination of the natural resources also potentially decreases biodiversity which causes a lower chance for them to develop eco-friendly, sustainable ways to farm. The development of eco-friendly farms would help the economy because then they could export food for higher prices. The development of eco-friendly practices will allow them to better conserve their natural resources.

Small farmers at either of the above poverty levels (extreme or moderate poverty) face additional challenges based upon where in Bangladesh they reside. High poverty levels exist in the northwest which suffers from both drought and high river erosion. The north central areas of Bangladesh receive severe seasonal flooding which decreases food production. The southern coastal regions have soils with high salt content (high salinity) which can severely inhibit growth of plants. Arable land in the southern coastal regions may decrease significantly if sea levels rise.

The effects of severe weather, from climate change may have severe results on Bangladesh. As the climate changes so do the inhabitants of Bangladesh. There are many lives at stake because of the over population and the loss in farm land. With the loss of farm land the economy will take a big hit and the steadily increasing economy will plummet and there will be major consequences. People will be without land food or a way to get a job. At this point the melting snow is giving them land but soon the land will be taken away because of erosion and common floods. If this happens people will need to utilize crops that are more flood resistant and more salt tolerant.

Something can be done in Bangladesh about the erosion problem. To prepare for what is coming they will have to learn how to prevent erosion. They will also need to learn more manageable and renewable way

of using the land that they have and be able to convert the land that is currently not suitable for crops or other habitat into land that can be used in the future. They will never be able to prevent flooding or other natural disasters, but they can establish procedures to prevent some damage. If they don't then they could have a very unstable economy in the future. The economy in Bangladesh has been steadily rising, but if they don't change how they do what they do then they will run into some major problems when it comes to competing with the rest of the world.

Major farming practices used now will not sustain them. Some may be utilizing technology to increase yields, but some who have found that technology may not know the impacts of it. Overuse of pesticides in some areas has contaminated waterways that were used for the fishing industry; they are not only losing the small portion of land that they can use for farming and development, but are destroying the water in which they could fish to get food. Bangladesh is approximately half the size of Iowa, but much closer to the ocean and closer to sea-level. The median height of Iowa is 1,100 feet above sea-level; whereas much of Bangladesh is only 9 to 30 feet above sea-level. Bangladesh may be impacted more negatively by water contamination than Iowa.

“Adaptation To Climate Change In Bangladesh: Learning by Doing”, provided a concise summary of issues Bangladesh may be facing (Ahmed):

Why is Bangladesh highly vulnerable? Bangladesh, a low-lying country is known globally as one of the most vulnerable countries to climate change.

- Its biophysical resources, particularly water, are highly sensitive to climate variability and change.
- People’s livelihoods & the food production system are at high risk.
- Disadvantageous biophysical characteristics exist.
- High population density.
- High prevalence of poverty.
- Poor institutional capability to deal with extreme climate events.

### **How can Bangladesh best face its challenges?**

I hate to admit it, but industrialized economies like the United States may be fueling changes in the global climate. Fossil fuels are fueling the greenhouse effect. Reductions in carbon dioxide released into the atmosphere are a vital step. Industrialized nations can and should take leading roles in reducing carbon dioxide emissions. If industrialized nations work together to decrease or stop the change in sea-level Bangladesh may be able to avoid losing land area. Additionally, Bangladesh can improve food security by applying the following three strategies.

- 1) Floating gardens: If Bangladesh residents increase the utilization of floating gardens (Baira) it may allow more food to be produced. Baira creates floating gardens. This approach may be used where land is submerged for long periods of time. “A typical example of floating agriculture in Bangladesh involves a floating layer of water hyacinth, straw or rice stubble to which is added upper layers of small and quick –rotting waterworts which make for good manure.” (Linham)

Increasing the use of floating gardens will decrease the negative impacts of frequent flooding and increase the food available to citizens. Ultimately more residents need to learn how to construct and manage floating gardens. Floating Gardens have been primarily used in the southern regions, but the strategy could benefit others if knowledge of their construction moves northward. These floating gardens allow for the production of cauliflower, tomato, and leafy vegetables.

- 2) Floating schools: If Bangladesh increases their utilization of floating schools (boat schools) more students may be allowed to spend more time learning than they have in land-based schools which often flood. In Iowa, I look forward to potential snow days, but weather directly impacts little of what I do. In Bangladesh, weather impacts virtually everything the people of rice-and-fish do. Increased use of floating schools could allow more young people to learn allowing more to be better prepared to face future challenges. Improving education may also improve their ability to improve their local economy.
- 3) Rain water Harvesting: If utilization of rainwater for use as freshwater is increased people will have more access to freshwater. Freshwater is a key to maintaining proper health. As their fresh water reserves are threatened by increasing salinity caused by flooding, it will be critical that residents have a source of fresh water. (Huq)

### **What if “climate change” is a fallacy?**

“Learning to Do” is in one of the titles in my bibliography. “Learning to Do” is also part of the FFA motto. I believe in learning to do. If we cannot change the direction science implies the world is moving, Bangladesh may not have enough land area to support their population. “Learning to Do” means utilizing science through practice. To address their most urgent issues, Bangladesh needs assistance from all industrialized nations as Bangladesh citizens also work to manage strategies to conquer environmental changes.

Plants will be damaged by increased amounts of salt water mixed with fresh water. Climate change induced migration may lead to enormous levels of conflict among the population of Bangladesh. Integrated rice and fish farming is a growing alternative source of food, especially protein. Unfortunately a rise in sea level may dramatically impact this alternative source of food and protein. Both rice and specific species of fish will be dramatically impacted by the increased salinity of soils and water.

Science supporting the impact of human activity on climate change is significant. Countries that have heavily used fossil fuels to develop their economies should be responsible in striving to reduce carbon released into the atmosphere. Under-developed countries like Bangladesh can assist with the effort by improving education of their people. In the year 2025, if climate science projections were false, industrialized nations will have saved fossil fuels for future generations to use. In the year 2025, if climate science projections were true, industrialized nations may have avoided major catastrophes in food production.

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