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Bangladesh – Food Security for the Future

Food security is defined as “access by all people at all times to enough food for an active, healthy life” (8). Despite the "green revolution" and the significant growth in international food aid and assistance, almost half of the world's less developed countries suffer a decline in aggregate food supply and more than a quarter an increase in child hunger (8). The issue of food security is important because the resultant malnutrition is a major barrier to economic and social development, leaving populations unable to maintain normal lives and be economically and socially productive. Like many other developing countries, Bangladesh faces a threat of increasing food insecurity.

Bangladesh ranks 4th in the world in the number of small farms, and farmers make up almost 63% of the population. However, these same farmers that make up more than half the population only contribute to 11% of the GDP per capita. Forty-five percent of Bangladesh’s population is below the poverty line (3). This is due, in part, to the increasing gap between rich and poor; by the mid 1980’s, the richest 10% of Bangladesh controlled 75% of the land. The poor farmers work under them, for almost no money, on relatively unfertile land. Although farming is a major industry in Bangladesh, the country has not yet achieved self-sufficiency in food production. Every year, two million tons of grains are imported to meet minimum needs of the population (2). However, the population is increasing rapidly, and the food produced is not enough to feed everyone. Unlike the wealthy, these subsistence farmers have neither the means nor the resources to dig themselves out of poverty and take part in the economic wealth of their city counterparts. If this disparity is not addressed, the dissatisfied majority could derail the country’s economy and food security. The Bangladeshi government and the food industry should balance their interests and invest significantly in appropriate scientific research into crop biology, sustainable agricultural systems and technologies for improving yields of food crops and not just cash crops. Appropriate scientific research will provide the Bangladeshi family farmers with the right combination of economic independence and food security, while preserving the biodiversity and natural resources of the landscape that make this country unique today.

Most subsistence farmers in Bangladesh do not own arable land, and are forced to live on flood-prone lands, making their crop yield unpredictable. The majority earn less than US$93 per year, and are forced to take jobs off the farm site, in small service industries, to keep their family alive (2). Since the poor only control 25% of the total land, most are forced to work as sharecroppers for wealthier landowners in exchange for basic food staples, such as rice, and fish in Bangladesh. With very limited access to technology and infrastructure such as electricity and transportation, poor communities of subsistence farmers struggle to supplement farming incomes through low-wage labor and small-scale enterprises such as handicrafts. Women are very much at risk in these farms –when the men leave to find work elsewhere and the crops cannot be harvested, women must run not only the household, but also the farm (2). The crops grown are typically staple foods, including rice, jute, sugarcane, and wheat. In addition, due to ample water sources in Bangladesh, fish harvesting and cattle farming is very common as well.

Subsistence farmers in Bangladesh use farming practices that have been in place for centuries. Due to soil erosion, however, only 55.39% of the land is arable as of June, 2008 (3). The agricultural year for the typical subsistence farm in Bangladesh begins in late February, when the weather is dry and getting warmer. Over a period of several weeks each field is plowed three or four times; using a wooden plow and two oxen, a subsistence farmer needs up to seven weeks of 8 to 10 hour workdays to plow just one hectare. In addition to plowing, field preparation for irrigation involves construction and maintenance

of plot boundaries half a meter high, using earth and weeds from the field. These boundaries also serve to retain water in the plots when the rains come a few months later. Traditional methods of irrigation include pitcher, swing basket, and a hollowed-out log fixed on a pivot and fitted with a counterbalance (2). These traditional farming practices are a major barrier to a higher productivity rate – there are no real technological advances, and the farmers are not educated enough to be aware of other possibilities. Their products are sold in the global market for much less, and thus, they do not make enough money. These farmers don't have access to many global markets, and no power to control the cost of any of their agriculture. The structure of the land makes it so that all the power is in the hands of a relatively small group of landlords. On the whole, lack of access to formal education, skills training, limited access to essential infrastructure, markets, and appropriate technologies inhibit the subsistence farmers' capacity to support their families with a reasonable standard of living.

Small farms dominate the agricultural landscape in Bangladesh, providing the largest source of employment and income to the rural poor. As opposed to large farm holders, small farms remain highly susceptible to poverty and hunger. With the increasing globalization and greater integration of agricultural markets, the need for increases in agricultural productivity for family farms is very important. Raising productivity and output of small farmers would not only increase their incomes and food security, but also stimulate the rest of the economy and contribute to broad-based food security and poverty alleviation (10). Larger farmers in the Third World are more cash crop oriented and smaller farmers more food crop oriented. Because of high transport costs and low agricultural productivity, rural food markets are thin and isolated. Consequently, farmers are confronted with food prices that are volatile and highly correlated with their own agricultural output. Because basic staples constitute a large share of total consumption and have low income elasticity, the random change in prices affects poor subsistence farmers quite a lot. Large farmers also differ from small farmers, not only in better access to credit and their better ability to sustain risk but also in the lower share that staple foods represent in their total consumption expenditure.

Subsistence farmers will benefit from increased investment into scientific research directed towards improving productivity and food security, as opposed to agri-business research. The recent expansion of the biofuel industry has reduced the supply of grain that is used for food. Additionally, as more developing countries start consuming more meat, the very inefficient grain to feed ratio involved in raising livestock leads to further commodity shortages and increased prices. Furthermore, the increasing salination of the soil in Bangladesh is decreasing the amount of arable land available, and thus, further reducing the subsistence farmers' crop yields. Along similar lines, soil erosion due to changing climatic conditions and overuse of the small amount of land available is detrimental to the Bangladeshi subsistence farmers. Conducting scientific research into crop biology and more efficient agronomic technologies can mitigate these causes of food insecurity. With new farm technology, the dependency ratio, the ratio of the economically dependent part of the population to the productive part, is predicted to fall from 79% to 55% in Bangladesh, which is nearly a 10% increase in the productive population (10).Thus, increasing access to farm technology will provide a substantial increase in economic activity and food security.

In the foreseeable future, biofuel production will continue to constrain the supply of staple foods, thus compromising the food security of Bangladesh and other developing nations. For instance, commercial production of biofuels may target high-quality lands due to better profit margins, leaving cereals and subsistence crops to lower-quality lands. Expanded biofuel production adds further uncertainty to other challenges related to food security, like population growth, changing diets, rising demand for biomaterials, expanding organic agriculture, climate change, and extreme climatic events (11). Currently, it is assumed that food production and biofuel production are mutually exclusive. However, by using agronomic technology to design more efficient bioenergy systems, it is possible to grow more crops for both food and biofuels, thus benefitting the Bangladeshi farmers in terms of profit and food for their families. If nitrogen-fixing crops used for biofuels are alternately planted with cereals,

a technique known as crop rotation, production can be enhanced in both the food industry and the biofuels industry. In addition, agricultural research into methods that improve productivity while conserving water can further contribute towards biofuel and food production working cohesively in a more sustainable way. This is an important area of research because biofuels themselves are extremely important. Biofuels can help meet the needs of the 1.6 billion people worldwide who lack access to electricity in their homes, and can also provide energy for local agricultural, industrial and household uses with less cost, in some cases, than fossil fuel (11).

As the demand for meat continues to grow in developing countries, so does the demand for grain to feed the cattle. Eighty-two percent of the projected increase in global cereal consumption and nearly 90% of the increase in global meat demand between 1993 and 2020 will come from developing countries, such as Bangladesh. Developing Asia will account for 48% of the increase in cereal consumption and 61% of the increase in meat consumption. Due to the increase of livestock feed demand, the composition of demand growth across different cereals will change dramatically (12). However, expanding the area in which to grow more crops will contribute very little to future production growth. Worldwide, the total increase in cereal area is projected to be 39 million hectares (ha) by 2020, from 700 million hectares in 1993. Eighty-eight percent of this growth will originate in developing countries. The projected slow growth in crop area places the burden to meet future cereal demand on crop yield growth (12). Bangladesh has an even more limited growth area, considering the lack of free, arable land. To combat this problem, the solution is not to meet the increasing demand for meat, then, with more feedstock based agriculture, but to research and develop alternative feedstock strategies, for example, using silage, for both livestock and aquaculture. In fact, according to research conducted on a dairy farm in England, using silage as the main constituent for cattle feed reduced the need for food grains without affecting the milk output (9). Perhaps, with a few alterations, the same could be true for Bangladesh.

Given that Bangladesh is primarily a coastal region, research into enhancing the existing aquaculture industry, e.g. fish farming, would be another strategy to alleviate the food insecurity in the face of increasing demand for nutrition. Recent research conducted into farming milkfish has shown that feedpea, an alternative to the commercial grain feed normally used, could be used to provide 20% of total dietary protein substitution resulting in better growth rates and feed conversion ratios than the commercial feed control (4). Further research into similar strategies could provide developing nations such as Bangladesh with an ability to meet the increasing demand for livestock or seafood while increasing the food security.

Soil condition is just as important as the amount of land available to food production. The thin topsoil layer of land is the best quality and most nutrient-rich soil. As the topsoil disappears, the soil below it, subsoil, becomes part of the tilled land, reducing nutrients and water retention, and making it harder for crops to grow. Soil erosion is a natural process, one that occurs even on grassland or in forests. But on land that is cleared and cropped, erosion often accelerates. Whenever the pace of erosion exceeds the natural rate of soil formation - what soil scientists call the tolerance or 'T factor' - the topsoil thins and eventually disappears, leaving only subsoil or even bare rock. Only when the soil erosion exceeds the T factor does the land begin to lose its long-term productivity (5). In Bangladesh, the already limited amount of arable land is further depleted by soil erosion, thus making research into prevention of further soil erosion and improvement of new soil formation an important topic.

Research in irrigation-induced technological change (ITC) in Bangladesh rice fields shows possible solutions to the alleviation of food insecurity that afflicts the majority of Bangladeshi farmers. With expanded research into more improved ITCs, the production of rice, a major factor in determining the GDP of Bangladesh, could be increased at a faster rate than the increase in population (1). Thus, the subsistence farmers would be able to not only have enough food for their own families, but also sell the surplus rice as a cash crop. Furthermore, such ITC research could benefit the farming of other grains and

cereals, such as wheat and sorghum. Growth in rice production not only benefits the health and well-being of the poor, but also the well-being of the country as a whole.

Saline soils contain an excess of soluble salts, especially sodium chloride, in such quantities that they interfere with the growth of most crop plants. The estimates indicate that Bangladesh has about 2.8 million hectares of land affected by salinity and poor quality water, most of this land being used for subsistence farming. The land relief and degree of flooding have mainly affected the formation of coastal saline soils of Bangladesh (13). However, research into global warming indicates sharp increases in sea level which would lead to further soil degradation due to salination. In a United Nations Development Program (UNDP) sponsored program, rice farmers in Sri Lanka are combating the problem of increasing soil salinity by planting hardier strains of rice that are more resistant to not only salinity, but also insects and disease. An added ecological benefit of this discovery is that these strains of rice tend to respond better to organic fertilizers. “Our objective is to find out what crop varieties can be cultivated under climate stress situations such as soil salinity," said Ramitha Wijethunga, UNDP's national program officer for disaster management. "Based on the results here, we will promote this type of mitigation practice in other parts of the island." (7) This could be another solution to the problem of increasing soil salinity in Bangladesh as well.

Implementing such research requires active involvement of local and federal governments, international organizations such as United Nations and FAO, NGOs, and progressive multinational corporations. Local and federal governments in Bangladesh have a vested interest in achieving self-sufficiency in food production, a national goal. However, they alone cannot sustain these ambitions without the help of international organizations who can bring in expertise and experience in relevant areas. An example would be the UNDP sponsored program in Sri Lanka that helped develop a hardier strain of rice that could withstand high salinity levels in soil (7). The experience of Grameen Bank in uplifting the lower classes in Bangladesh could also provide a powerful launching platform for implementing the research. Finally, NGOs and multinational corporations can partner with these organizations to provide a long term food security plan for Bangladesh.

Bangladesh is among the few countries in the world where the majority of the population lack food security, as reflected in extreme poverty and the reality of hunger in their everyday lives. By conducting scientific research into areas such as decreasing salination and soil erosion, improving crop yields and resistance, and developing alternative livestock feed and biofuel sources, Bangladesh can provide its subsistence farmers with sustainable food security and a better overall economy.

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