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Bangladesh, Sustainable Agriculture

Bangladesh: How Economics can aid in Sustainable Agriculture

Introduction

As the world's population increases, the strain on agriculture also increases. This strain on agriculture is seen in Bangladesh, which is notable for producing crops such as rice, wheat, maize, pulses, potatoes, and oil seeds (Global Yield Gap Atlas). The demand for agriculture is causing additional land to be used for farming, prompting deforestation in many areas. The need to maximize output of crops and to address demand for specific crops has led to soil depletion. Climate change also poses a threat to Bangladesh's agriculture. Additionally, there is an issue with obtaining these goods, as people in certain areas lack adequate transportation to access domestic markets or the money to purchase food. My research question is how economics can be used to promote sustainable agricultural practices.

Country and Family

Bangladesh is located between Burma and India. With a population of 167 million (as of 2023), improving agricultural practices in Bangladesh is essential. Bangladesh's age structure is as follows: 25.38% are ages 0-14, 67.09% are ages 15-64, and 7.53% are ages 65 and older (The World Factbook). Bangladesh is a nation that is 39.71% urban and 60.29% rural as of 2022 (Statista). Many of the rural areas in Bangladesh consist of villages that host on average 4.3 people per household (ArcGIS). Houses often consist of mud walls, thatched roofs, tin-sheets, and bamboo (Facts and Details). The typical family diet reflects Bangladesh's strong emphasis on agriculture: rice, few vegetables, and small quantities of fish (if available); milk, milk products, and meat are rarely consumed and if so, consumed in small quantities (Food and Agriculture Organization). The lack of proper nutrients in Bangladeshians' diets and lack of access to clean water and sanitation facilities increases susceptibility to major infectious diseases.

Bangladesh's gross domestic product (GDP) is \$329.545 billion (as of 2020), and it is notable for exporting commodities, such as leather, and crops (The World Factbook). As of 2023, the income per capita is \$2,793 (Mavis). Approximately a quarter of the population was living below the poverty line in 2016 (The World Factbook).

Bangladesh is a parliamentary republic, though previously under an authoritarian regime, that ranks below the 20th percentile in the World Bank's measure of political stability (Australian Government). Despite having a progressive form of government, Bangladesh's low government ranking on the global stage is caused by economic hardship.

Challenges and Impacts

Bangladesh's agriculture faces challenges to sustainability. Cultivating crops requires farmland, and Bangladesh has 70.1% agricultural land and 59% arable land (as of 2018), which are high percentages compared to other countries in similar size, notably Georgia that has 35.5% agricultural land and 5.8% arable land (as of 2018) (The World Factbook). Bangladesh's farmland statistics also are impressive when compared to those of the United States, which has 44.5% agricultural land and 16.8% arable land (as of 2018). However, being a mostly riverine country, having plains subject to flooding, and having a humid climate influenced by the monsoon winds have caused issues with Bangladesh's geography. Additionally, urbanization in Bangladesh competes with agricultural land, which ultimately decreases the land available for farming.

Climate change also causes increased global temperatures and elevated sea levels, which lead to land erosion. Land erosion causes there to be less arable land available for farming, which places pressure on

farmers to engage in extensive farming. In addition, many farmers use pesticides, herbicides, and chemicals to increase yields within limited land. Those applications, however, cause much harm to the soil quality as well as the environment. The increase in temperature also shifts agricultural production areas, posing challenges to farmers; climate change also contributes to high levels of salt accumulation in Bangladesh's water, which makes it unsafe for consumption. There is also an issue with small farmers being inefficient in their agricultural production. The intertwining of climate change, agricultural inputs, and production inefficiency make it challenging for Bangladesh's agriculture to become sustainable.

Factors that contribute to Bangladesh's poor economy are inflation as well as Bangladesh's lack of resources. For example, Bangladesh relies on imports of fossil fuels because its own oil reserves are depleted, yet issues such as the Russian-Ukraine War have increased oil prices that make imports much more expensive and unattainable. Though an unsustainable source, fossil fuels are responsible for powering machinery used in agricultural production and for transporting crops and other inputs to domestic and foreign markets. The increased price of fossil fuels increases the production costs of agriculture, which decreases the affordability of different goods for Bangladeshians. The decrease in affordability makes those goods less attainable for the average Bangladeshi family and disproportionately harms low-income and rural-located people. The lack of access to the agricultural products results in malnutrition that mostly affects children. Children being affected the most is an issue because they will constitute the workforce in agriculture.

Recommendations

Despite these issues, the Bangladeshi government can adopt the following practices to address the need for sustainable agriculture and to combat food insecurity:

1. Incorporate genetically modified organisms (GMOs) into farming

In 2014, the Bangladeshi government approved the usage of Bt brinjal, which can provide resistance against insects to use in crops (National Library of Medicine). The inherent ability of genetically engineered crops to resist outside factors reduces the need for farmers to use pesticides, which can harm the soil and are costly. Continuing the development of GMOs would prevent ground contamination from pesticide use, thereby allowing more land to be used for agricultural development and other purposes, ultimately reducing the burden on Bangladesh's food cultivation. Additionally, GMOs also can provide key nutrients, an example being how golden rice provides nutrients such as beta-carotene that is converted to Vitamin A for the human body (National Library of Medicine). The added nutrients in GMOs would provide people with key nutrients that they cannot obtain in their natural diets. The development of GMOs in Bangladesh could come from non-governmental organizations (NGOs) such as the Bill and Melinda Gates Foundation, which has advocated for the use of GMOs as a solution to food insecurity in African countries (Bill and Melinda Gates Foundation). Ultimately, because GMOs can decrease yield costs, their market prices can be lowered, which will make food more affordable for consumers.

Though promising, there is some controversy with GMOs. One of the main arguments against GMOs is that they can lead to decreased biodiversity and dependence on major seeds. Therefore, one course of action is to have the government limit the number of GMOs that are utilized. Golden rice, soybeans, and maize are examples of prominent GMOs, and they have an essential part in many people's diets.

Using GMOs is a sustainable approach that eliminates the need for harmful pesticides, improves soil fertility, and is culturally accepted in Bangladesh. While citizens of other countries may resist GMOs, Bangladesh is seen as a willing participant in using biotechnology to accept GMOs (Mancombu).

Should GMOs meet resistance in Bangladesh, research should be conducted to determine what non-modified organisms would thrive best in Bangladesh's environment. Due to the high salt concentration in water, Bangladesh has seen micro-levels of success from implementing floating

vegetable gardens, which allow for plants to absorb nutrients from organic matter and water at a low cost and often have surpluses that can be sold (Sunder). Additionally, shrimp farming is prominent in areas of Bangladesh because shrimp are salt-water organisms, yet the over-consumption of shrimp has led to an ecological imbalance (Paul, Vogl).

The sustainable and macro solution to this issue is to address the large amounts of salt water. This can be done through mangrove afforestation, which is the process of restoring mangroves (productive wetlands) that provide natural infrastructure to reduce erosion and absorb impacts of natural disasters (The Nature Conservancy). Implementing mangroves can prevent salt water from seeping inland and contaminating groundwater, which Bangladeshians rely on, and trap sediments that preserve the land. The economics portion of this solution would consist of government-sponsored efforts, where people would have employment opportunities to participate in restoring mangroves. The government would be incentivized to sponsor such projects because the environment affects the wellbeing of its people, and providing people with work allows for them to have increased purchasing power, which can stimulate the economy and support other sectors.

2. Establish microloan reforms

First established in the 1970s, microloans' main goal was to reduce rural poverty by providing small loans for non-crop activities like trading and raising livestock (Gustafson, Khandke). Now, Bangladesh has a variety of successful microfinance institutions that have enabled over 40 million individuals to benefit (Rahman). The distribution of microloans is already being done by microfinance institutions in collaboration with the government, and Bangladeshi community members play the role of using these loans to improve their financial situation. However, drawbacks to micro loans include the possibility that banks may be subject to bad debts and volatile interest rates (AGRIM Housing Finance). Additionally, despite the high usage of microloans, Bangladesh has not ascended to high levels of development. Thus, reform with microloans is needed.

I propose the following for reforming microloans:

- 1) Establish a code of transparency among creditors, which include the following:
 - a) Requiring a disclosure of pricing structure and payment dues to allow consumers to make informed decisions
 - b) Setting a maximum interest rate to prevent predatory lendings
 - c) Encouraging creditors to offer different types of loans to provide flexibility with consumers
- 2) Establishing a credit database
 - a) Creating a written record of all consumer transactions to prevent over-borrowing
 - b) Collaborating with community-based or non-governmental organizations to share consumer history with other creditors
 - i) Consumers must give written consent to having their purchasing history shared with other microloan creditors

However, more has to be done than reforming microloans, which are mainly a tool for businesses in Bangladesh. There must be economic and environmental awareness, and therefore, I propose the creation of community learning centers and mobile education units that inform Bangladeshians about financial literacy and agricultural sustainability. One non-governmental organization that could assist in such matters is the Aga Khan Foundation, which established schools in Kenya for children (Commonwealth of Nations). Children are the next generation, and educating them for the future is paramount; such education could consist of sustainable agricultural techniques, suggestions for managing money, information about government subsidies, and implications of climate change.

Additionally, digital finance services should be developed. Implementing digital finance services can reduce financial institutions' costs and increase the reach of financial products to remote areas that are not able to access traditional brick and mortar channels (Harvard Business Review). Of course, implementing a digital financial banking system requires significant research as well as combating the lack of internet access in rural areas, but the disparity in internet access can be fixed by implementing 5G, technology used for cellular service, that has improved internet access for rural areas in Canada and Brazil; the Bangladeshi government is also taking measures such as starting the Rural Connectivity Improvement Project (RCIP) to improve rural digital access (Islam). A digital financial banking system can assist the use of sustainable agriculture as it can provide direct funding to farmers who require materials to enact sustainable farming practices (ex: purchasing GMOs, technology to monitor crop growth, and irrigation systems).

3. Implement a debt-for-nature swap program

A debt-for-nature swap program consists of an investor that assumes part of a government's debt and is given shares in a state-owned company or is given domestic currency that is used to finance specific projects such as building sustainable infrastructure. An example of a debt-for-nature swap occurred when the government of Peru redirected \$20 million in debt payments owed to the United States to conservation funds aimed at protecting and restoring forests (U.S. Department of Treasury).

I propose the following guidelines for the program:

- 1) Three parties must be present: the creditor, the debtor, and an environmental non-governmental organization who would act as a broker
 - a) All parties must give explicit consent to the program via written contract to prevent disputes over national sovereignty
 - b) The implementation of sustainable projects will be overseen by non-governmental organizations
 - c) The country benefiting from the procedure must publicize its development projects to ensure transparency and the non-misappropriation of funding
- 2) The Economic and Social Council will conduct reports on the implementation of sustainable projects and maintains the right to intervene if it suspects misappropriation of funds
 - a) To ensure a high standard of work, the quantity and frequency of projects' implementations is at the discretion of this group

Currently, China is one of Bangladesh's largest creditors (Shah). As the world's largest bilateral creditor, China's debt swaps align with its willingness to foster climate resilience and contribute to the fight for global financial stability, thus incentivizing that country to aid Bangladesh and improve Bangladeshi-Chinese relations (Ray, Simmons). China has also demonstrated its willingness to aid in the fight for climate justice notably through its Belt and Road Initiative, which consists of physical infrastructure that links Asia, Africa, and Europe as well as the funding of special economic zones designed to create jobs and interest in promoting the 5G network run by Chinese digital communications company Huawei (Berman, Chatzky, McBride). China would benefit from assisting Bangladesh as its location would give China a stronger influence in SouthEast Asia; additionally, China would have the opportunity to promote its technology to Bangladesh, who sees limited internet access.

China playing a role in acquiring the debt swap program would create much-needed fiscal space for Bangladesh's government, which would allow the government to use its budget in other areas such as subsidizing food to combat hunger and malnutrition; create employment opportunities for off-farm jobs for farmers; and implement much needed resources in order to have sustainable agriculture such as preserving forests to enable agroforestry, the growth of trees and shrubs among crops and grazing land to enhance productivity and irrigation infrastructure such as drip irrigation, which is when water flows through a filter into special drip pipes and moisturizes soil near plants' roots that aids in water

conservation (University of Massachusetts Amherst). The debt swap program would be a strong program to use for sustainable projects that are too costly for the Bangladesian government to implement on its own terms.

4. Enact government policy reforms

The Bangladesian government's total budget is \$71 billion for the 2023-2024 fiscal year (Karim). Of that budget, only 5.7% was allocated to agriculture (Centre for Policy Dialogue). Increasing the agriculture budget would make the government more capable in assisting its farmers through the following: subsidizing new technology (ex: precision agriculture, precision irrigation, and automation) to improve sustainability in farms; providing support to improve farmers' skill sets for practicing sustainable agriculture; and importing nutritious food from other countries to mitigate potential food shortages.

If the budget is unable to increase, then the Bangladesian government should enact social protection policies. These policies could consist of tax credits for Bangladesian businesses who demonstrate a clear initiative for developing sustainable practices and allow for potential effects such as wage increases, decreased goods and services, and increased employment opportunities.

Additionally, the government should give priority to trained professionals (ex: scientists) to prevent brain drain, the emigration of highly trained people from a country. Initiatives such as research stipends could give professionals the motivation to stay in their home country while being able to investigate methods for improving the standard of living. Moreover, because brain drain is often caused by social factors, the Bangladesian government should be more receptive to its people's concerns and encourage civic participation of its citizens. Improving social issues would not only incentivize people to remain in the country, but it would also increase the standard of living, thus being seen as a more favorable country for others to work with on the global stage.

Conclusion:

The proposed solutions are listed as follows:

- 1) Promoting the use of GMOs and discussing viable alternatives
- 2) Outlining steps for microlending reforms as well as long-term approaches for education
- 3) Implementing a debt-for-nature swap program that would be overseen by the United Nations to prevent issues with national sovereignty and to ensure transparency
- 4) Encouraging the Bangladesian government to enact social reforms to retain its population

Enacting the proposed recommendations is challenging as it requires domestic and global cooperation, securing of funding sources, and educating the farmers and public. Solutions must be nuanced, and relying on one solution is insufficient. Additionally, there must be alternatives to solutions because there could be unforeseen circumstances that prevent a course of action from being taken. Addressing climate change must be aligned with economic policies as the biggest risk to green programs is the potential impact of an unstable labor market

Agriculture plays a major role in Bangladesh's GDP since it is used in exports, employment opportunities, and nourishing the public. Implementing sustainable agriculture will combat food insecurity and malnutrition issues, which will establish a positive feedback loop that allows for a healthier workforce, which ultimately leads to more efficient production. Food is what sustains any population, and it is essential that the Bangladesian government takes the necessary steps to promote food security to ensure the prosperity and wellbeing of its people.

However, Bangladesh is on track to graduating from the United Nations's list of developing countries by 2026, showing its potential to improve economic conditions that would enable the widespread implementation of sustainable agriculture.

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