

# Bangladesh: Poverty associated with Soil Degradation

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## Abstract:

Sustainable development goals (SDGs) have been proposed in 2015 by the United Nations as a blueprint to be achieved by 2030 to promote sustainable development for the next generation. Withal the SDGs, poverty would be the priority focus, embedded with numerous social problems. Therefore, this section will explore the ongoing poverty in Bangladesh and how to improve Bangladesh poverty via coping with soil degradation; By discussing and comparing with implements that have been applied in Bangladesh and others.

## Background:

Bangladesh is a small country between India and Myanmar, with an approximate population of 164.7 million. The ongoing poverty crisis in Bangladesh is mainly caused by the vulnerability of its geographic location, lack of infrastructure, and gender inequality. To overcome the poverty crisis, it is crucial to develop Bangladesh's three main industries: the agriculture, industry, and construction and service sectors. This review will focus on improving soil degradation to mitigate poverty, as agriculture growth depends on the soil.

Bangladesh, located in the deltaic plain of the Ganges and the season wind belt in South Asia, suffers from intensive precipitation (approximately 2200 millimeters annually), causing severe flooding and soil degradation. Some conducted research stated that 65% of its land was categorized as a floodplain, of which approximately 43% of land in Bangladesh has been degraded (M.Robiul Islam, 2018), and it worsens with an increasing rate of 1.48% (M. K. HASAN, 2006). Moreover, agriculture yield decreases due to fewer soil nutrients, which leads to less land used for cultivation because of soil degradation. Recent research shows a 50% reduction of agricultural land turning into wetland in the Ganges delta. The worsening soil degradation makes Bangladesh's economy more vulnerable, as agriculture is the known lifeblood of the economy, accelerating Bangladesh's sustainable development and growth (Md. Tahidur Rahman, 2017), with 2/3 of its population are relying on the agricultural industry.

To overcome the difficulties caused by soil degradation, production has been shifted to produce higher nutrient and higher profit crops. However, it is not sustainable in prospect, as long-term soil degradation might act as a catalyst to form famine in Bangladesh. As a matter of fact, 1/4 of Bangladesh's population is currently suffering from food insecurity, and 40 million are suffering from acute hunger (World Food Program). The number is expected to enlarge if no immediate actions are taken. This could further form a poverty trap, as people will be insufficient in food and nutrients, as malnutrition and illness will come along, making people unable to work; Income in households would be spent on healthcare to cure illness, hence further increasing poverty. What is more concerning is that crops cultivated under degraded soil, especially contaminated ones, can further deteriorate people's health through an accumulation of ingestion. Therefore, it is vital for people to grow consciousness over soil degradation and to minimize unwanted consequences.

## Introduction of Soil Degradation in Bangladesh:

Soil degradation is the result of a reduction in soil quality and quantity. The causes are partially due to natural activities, such as flooding, and partially due to human-involved, especially after industrialization. The problems in Bangladesh are a combination of these two. In Bangladesh, significant soil degradation is due to soil erosion, heavy metal contamination, compaction, waterlogging, and improper agricultural practice.

### Types of Natural causes:

Soil erosion in Bangladesh is regarded as the most serious problem causing soil degradation. Some research shows that there is a total soil loss of 2.0~4.7 ton/ha per year (Bangladesh Agriculture Research). Hence, over a quarter of agriculture land degradation is attributed to soil erosion, as the result of high frequency of intensive precipitation and flooding. Water carries away nutrient topsoil along the water way, removing sediment and reducing soil fertility. Another worrying issue is the geographical features in the Bangladesh, where 12% of the land is tertiary hills landscape, making it more susceptible toward erosion. Heavy precipitation tends to wash more soil away in the hilly areas (And as statistics reveals, 1.7 million-hectare farm land in the hilly areas is faced with a worse scenario.)

Heavy rainfall can lead to another problem of waterlogging, where the soil has been fully saturated with water due to high frequency of intensive rainfall. This phenomenon causes could retard the growth of the plants and crop, due to the lack of oxygen for respiratory process. In addition, compaction is another natural impact, which happens when soil has a low porosity, making it hard for water to penetrate through the soil.

### Types of Human-involved factors:

The major problems are involved with heavy metal contamination and inappropriate agricultural practice. In recent years, the rapid increase in human activities in industrialization and urbanization rendered environmental issues for Bangladesh because toxic elements from municipal wastes, industrial effluents, chemical fertilizers, and pesticides enter the soil and further influence food safety. For instance, soil near the industrial area in Dhaka, Gazipur, and other industrial cities has shown excessive heavy metals such as arsenic, lead, cadmium, and chromium.

During the dry season in Bangladesh, many agriculture applies irrigation in usage, contributing to exacerbating heavy contamination in the soil and salinization. Further heavy metal contamination has been caused by irrigating the contaminated water into the soil. Where irrigating the contaminated water in Hazaribagh leather industrial area in Dhaka caused a high concentration of Cr in the local soil (M. Muminul Islam, 2018). Salinization is a severe problem – 2.86 million hectares of coastal and offshore land

and 1.056 million ha of arable lands were influenced by salinization. This phenomenon happens to be a natural process as there are soluble salts in the soil. However, irrigation intensifies the salinity in the soil leading to salinization; The water forms this was absorbed by the plant, while the salt in the water was left behind in the soil leading to increase salinity.

The inappropriate agricultural practice would also influence soil degradation. Bangladesh shows high reliance on its agriculture industry, as it takes up 17.5% of the country's GDP, with 48.4% of the population were employed in the agriculture industry ( World Bank). Hence, rice is the staple food for 135 million people in Bangladesh, making it a top priority compared with other crops in the country. Therefore, many farmers chose to cultivate rice in monoculture; however, this could cause the soil to become susceptible and degraded due to the unchanged environment making pests and bacteria easy to adapt to the environment. Also, single crops planted in a specific area could lead to depletion of a particular nutrient in the soil, which the crop needed for growth. Monoculture in Ireland in 1840, where they cultivate 'lumper' (a variety of potato), and later on a potato blight disease has been brought from America to Ireland, all the potatoes in Ireland happen to dyed out due to the susceptible of soil to the environment, within this it better to operate cultivation in a polyculture scheme. Also, inappropriate agricultural practices could form soil degradation by inadequate usage of fertilizer. By 60% of Bangladesh, arable land was inefficient with nitrogen, phosphorus, and potassium, which worsened the quality of the soil (G. Rahman, 2004).

Dam construction is the most controversial among all human influences, as it has more long-term ecological effects. In Bangladesh, three dams have been constructed. In the long run, sediment is expected to be trapped at the dam, making disequilibrium of soil sediment distribution and worsening the situation of soil erosion. Soil from the natural flows before the dam construction was an efficient and effective method to fix the problem of soil erosion in the deltaic area. The deprivation of soil sediment in the dams worsens soil erosion in downstream because of insufficient replacement. This problem has been recorded and witnessed in the Nile, with 100 million tonnes of sediment deposited at the dam. This further impacts the soil's nutrient downstream, making it less fertile and mal-nutritious for cultivation, as sediment was not effectively transported toward the downstream.

Overall, comparing with the natural causes and the human involved factors, the human-involved factors deserve greater attention in the study and research of soil degradation, as these factors are completely controllable and the risk is preventable.

## Goals:

Withal this problem, goals had been set by the Bangladesh government and the United Nations to achieve by 2030. But the main focus goal among the others in this section is the improvement in soil fertility. As in my perspective, the priority is to improve soil fertility and soil contamination and pollution because these factors are considered the most applicable in practice, and they have relatively more potential to downsize the national scale of poverty in the future

## Remedies:

To improve the soil fertility, the local government has developed a software called Online Fertilizer Recommendation System, which helps farmers to make the decision on the selection and the amount of fertilizers according to the specific cultivation location. The recommended doses are trustworthy, as they are given base on the analysis by the Soil Resource Development Institute in Bangladesh. Within application of scientific use of fertilizers, an increase in the crop yield of 7-22% can be achieved (M.A. Houssain, 2020). However, a major problem in practice is whether farmers are able put the recommendation into practice. Therefore, offline activities are necessary, which are designed to help farmers to remove the practical obstacles. One problem for farmers is the concerns over inappropriate use of fertilizers. Most farmers are with limited education, therefore, reading information online is not possible for most of them. Whereas demonstration at the scene is helpful, and more questions can be answered to address theirs worries. Another problem for farmers is the lack of financial support. Artificial fertilizers, compared with traditional ones, are more expensive. Farmers also complain that they do not have reliable access to fertilizer supplies. Therefore, the Online Fertilizer Recommendation System needs further organize offline activities to teach the farmer how to use the fertilizer with the appropriate dose, and reward them with fund to purchase fertilizer for cultivation. (After attending to lesson of appropriate agriculture practice) In this way, the local government can directly subsidy farmers by dispatching discount for fertilizer purchase, and diminish the circumstances of inappropriate agricultural practice.

Heavy soil contamination and soil pollution is a severe problem in Bangladesh, as it vastly influences the food source. Bangladesh is a riverine country that greatly depends on the river, exaggerating soil contamination by water penetrating the soil. (Which means soil contamination can reach other regions

easily through water-flow) The Bangladesh government has proposed a framework for preventing and mitigating soil pollution. According to the framework (Article 8 of Bangladesh Environment Conservation Act 1995), the factory must have a certificate from the Department of Environment, and factories containing any toxic effluent must install a filtration system to treat the effluent before flowing out to the reservoir or the environment. However, the proposed framework was not an effective strategy conducted among the Bangladesh government. As the factories did not follow the instruction to install a filtration system, the unsuccessful enforcement initially started with the lack of governance and supervision as there is no specific regulatory department assigned; secondly, owing to the process of irregularities and how was operated. Moreover, Faruque critiques the framework as outdated, where it could no longer efficiently address the soil pollution that Bangladesh is encountering. Therefore, changes could be made by forming the framework in progressive stages to enforce.

Various countries also struggle with soil contamination, but China has the most common causation of soil pollution with Bangladesh, which are industry and agriculture waste, respectively. Therefore, Bangladesh can conduct a similar implement based on the framework of China. The framework that China carries out is a ten stages enforcement (Tiankui Li, 2019). Which are:

1. Conduct study about classifying soil pollution and the soil environment
2. Promote legislation on soil pollution prevention
3. Implement an agricultural land classification management system to ensure the safety of agricultural products
4. Implement construction land access rules to prevent environmental risks due to improper settlement
5. Strengthen the protection of uncontaminated soil and strictly control new threats of soil pollution
6. Strengthen the supervision of pollution sources and focus on pollution prevention
7. Conduct pollution control and restoration to improve the quality of the regional soil environment
8. Increase scientific and technological research and development and promote the development of the environmental protection industry
9. The government should play a leading role in unbuilding the soil environmental governance system.
10. Strengthen the evaluation of achieved targets and implement a strict responsibility system

In the scope of Bangladesh, the optimum framework to mitigate soil pollution is soil remediation cooperating government intervention within land zoning, legislation, and subsidy. To prevent the further spread of soil contamination through wind and water, the government should first establish specific government departments supervising and identifying the potential contamination. Then, subsidize the industrial factory to use a high standard filtration system to purify the sewage, diminishing further influence of the semi-sewage or sewage (if it is not filtered at all) to the land and reservoir. Factories, who do not follow the regulations of installing a good filtration system and emitting contaminated water toward the ecosystem, must be heavily fined, hence paying the responsibility of remediation in that particular area that has been contaminated. Furthermore, progressively government should land zoning by creating specific areas for developing industrial factories, with more favorable taxation and financial supports to attract more investment there. Therefore, all the industrial factories can be concentrated in a particular area. The government can collect all the sewage water from the factories and purify them at a lower cost, thus minimizing the situation of some factories not installing filtration systems.

Meanwhile, the government should encircle the contaminated land to ban agricultural and other practices and classify the rate of contamination. With the result, the researcher can conduct which type of soil remediation will be the most appropriate, whether to use chemical, physical, and biological treatment to reduce the concentration of pollutants, reduce the bioavailability of the contaminant, containment and removal the contaminated area. For example, physical soil remediation can remove the contaminants by using water to neutralize the soil, blend the soil with clean soil, or cover it with clean soil. (It is essential for the government and research institutes to examine and verify the contamination in the polluted land, to find out and implement practical actions to detoxify the affected areas before being available for agricultural production or other usage in the future)

Despite the influences caused by industrial sewage, irrigation reduction could help reduce soil contamination, as Bangladesh has high exposure to arsenic in the groundwater. Within the long term, arsenic might happen to accumulate, making the soil to be toxic. Currently, arsenic has influenced 59 districts in Bangladesh, and it has been consumed over average; therefore, policy should be proposed to regulate and mitigate the usage of heavy arsenic contaminated land.



## Conclusion:

Although there has been a decrease in the rate of people living under the poverty line, it is still a big problem for Bangladesh, as diminishing poverty is the start of sustainable economic growth of a country. Improving soil fertility and soil contamination are the most influential ways to enhance agricultural production to mitigate poverty since Bangladesh relies highly on its agricultural industry. Coping with soil degradation can provide people with a self-sufficient and non-contaminated food supply, further allowing people to sell their agriculture products and help households escape from the poverty trap. Moreover, on a macro-scale, poverty coexists with many other social problems in the SDGs' goals, such as zero hunger, good health and well-being, clean water and sanitation, etc. However, coping with soil degradation can indirectly improve these circumstances in Bangladesh. Despite the government's actions to improve soil fertility, limited actions have reduced soil contamination. Therefore, to make the framework operate efficiently, the Bangladesh government should establish effective governance, which is the biggest barrier to the success of any legislation and framework as the Bangladesh government were in lack of due to bureaucratic intemperance and corruption.



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